Recent trends in fertility and mortality in Indonesia

COMMITTEE
ON
POPULATION AND
DEMOGRAPHY,
REPORT NO. 29

PAPERS
OF THE
EAST-WEST
POPULATION
INSTITUTE,
NO. 105

MAY 1987

NATIONAL RESEARCH COUNCIL
WASHINGTON, D.C.

EAST-WEST CENTER
HONOLULU, HAWAII

PAPERS OF THE EAST–WEST POPULATION INSTITUTE, published about eight times a year, facilitate early dissemination of research findings and policy-relevant reports on the populations of Asia, the Pacific, and the United States.

NOTE TO CONTRIBUTORS: The Population Institute considers unsolicited as well as commissioned manuscripts for the Paper Series. Appropriate topics are demographic trends and estimation, fertility and family structure, economic development and human resources, urbanization and migration, and population policies and programs. All manuscripts are reviewed. In selecting manuscripts for publication, the Institute considers quality of scholarship and usefulness to public officials and other professionals in the field of population; it also seeks contributions reflecting diverse cultural and disciplinary perspectives on population. The series can accommodate articles not necessarily suited for journals because of unusual length or treatment of subject. All copy must be typed double-spaced. For additional information on manuscript preparation, write to Editor, Paper Series.

OTHER SERIAL PUBLICATIONS OF THE EAST–WEST POPULATION INSTITUTE

Working Papers are circulated for comment and to inform interested colleagues about work in progress at the East-West Population Institute. They are intended to complement evidence of completed work as reflected in Papers of the East-West Population Institute and the Reprint Series. $1 per copy.

Reprint Series brings selected articles originating from Institute research but published elsewhere to the attention of population specialists who might not otherwise see them. Single copies available upon request.

Asian and Pacific Population Forum brings articles of potential value in policy formulation, program administration, and research to the notice of policymakers, professionals, and scholars concerned with population matters in the Asia-Pacific region. Published quarterly in November, February, May, and August. Annual subscription rate, $12 (free to individuals and organizations involved in population-related work).

Asia–Pacific Population & Policy brings condensed reports based on Institute research to the attention of policymakers and others interested in population developments in the Asia–Pacific region. Available upon request.

Serial publications except Working Papers are available without charge to libraries serving population specialists and to professionals and scholars in the field of population. Requests describing the nature of the research or program and the intended use of the publications should be addressed to: Publication Sales and Distribution, East-West Center.

Available from:
East–West Center
1777 East–West Road
Honolulu, Hawaii 96848, U.S.A.

Lee-Jay Cho, Director
Sandra E. Ward, Series Editor

COMMITTEE ON
POPULATION AND DEMOGRAPHY Report No. 29

PAPERS OF THE
EAST-WEST POPULATION INSTITUTE No. 105

Recent trends in fertility and mortality in Indonesia

Panel on Indonesia

Committee on Population and Demography

Commission on Behavioral and Social Sciences and Education

NATIONAL RESEARCH COUNCIL
Washington, D.C.

Published in cooperation with
THE EAST-WEST CENTER
Honolulu, Hawaii May 1987

NOTICE: The project that is the subject of this report was approved by the Governing Board of the National Research Council, whose members are drawn from the councils of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine. The members of the committee responsible for the report were chosen for their special competences and with regard for appropriate balance.

This report has been reviewed by a group other than the authors according to procedures approved by a Report Review Committee consisting of members of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine.

Library of Congress Cataloging-in-Publication Data

Recent trends in fertility and mortality in Indonesia.

(Papers of the East-West Population Institute,
ISSN 0732-0531 ; no. 105) (Report / Committee on
Population and Demography ; no. 29)
Bibliography: p.
1. Fertility, Human—Indonesia. 2. Mortality—
Indonesia. 3. Indonesia—Statistics, Vital.
I. National Research Council (U.S.). Committee on
Population and Demography. Panel on Indonesia.
II. Series. III. Series: Report (National Research
Council (U.S.). Committee on Population and
Demography) ; no. 29.
HB1057.R43 1987 304.6'32'09598 87-11178
ISBN 0-86638-092-2 (pbk.)

PANEL ON INDONESIA

LEE-JAY CHO, East-West Population Institute, Honolulu, Hawaii
GRIFFITH M. FEENEY, East-West Population Institute, Honolulu, Hawaii
PETER MCDONALD, Department of Demography, Australian National University
SI GDE MADE MAMAS, Central Bureau of Statistics, Jakarta
GEOFFREY MCNICOLL, Center for Policy Studies, The Population Council, New York
MASRI SINGARIMBUN, Population Institute, Gadjah Mada University, Yogyakarta, and The Population Council
SAM SUHARTO, United Nations Statistical Office, New York
HARYONO SUYONO, National Family Planning Coordinating board, Jakarta

ROBERT J. LAPHAM, Study Director

COMMITTEE ON POPULATION AND DEMOGRAPHY

ANSLEY J. COALE (Chair), Office of Population Research, Princeton University
WILLIAM BRASS, Centre for Population Studies, London
LEE-JAY CHO, East-West Population Institute, East-West Center, Honolulu
RONALD FREEDMAN, Population Studies Center, University of Michigan
NATHAN KEYFITZ, Department of Sociology, Harvard University
LESLIE KISH, Institute for Social Research, University of Michigan
W. PARKER MAULDIN, Population Division, The Rockefeller Foundation, New York
JANE MENKEN, Office of Population Research, Princeton University
SAMUEL PRESTON, Population Studies Center, University of Pennsylvania
WILLIAM SELTZER, Statistical Office, United Nations
CONRAD TAEUBER, Kennedy Institute, Center for Population Research, Georgetown University
ETIENNE VAN DE WALLE, Population Studies Center, University of Pennsylvania

ROBERT J. LAPHAM, Study Director

NOTE: Members of the Committee and its panels and working groups participated in this project in their individual capacities; the listing of their organizational affiliation is for identification purposes only, and the views and designations used in this report are not necessarily those of the organizations mentioned.

CONTENTS

LIST OF TABLES *vii*

LIST OF FIGURES *xi*

PREFACE *xiii*

SUMMARY *1*
  Mortality *1*
  Nuptiality *5*
  Fertility *6*

1 INTRODUCTION *11*
  Purpose and Scope *11*
  Background *11*
  Organization of This Study *12*

2 DATA SOURCES AND AGE DISTRIBUTION ANALYSIS *13*
  Data Sources *13*
    1961 Population Census *13*
    1971 Population Census *14*
    1980 Population Census *14*
    1973 Fertility-Mortality Survey *14*
    1976 Intercensal Population Survey *14*
    1974–77 Sample Vital Registration Project *15*
  Age Distribution *15*
    General Assessment of Age Distribution Quality *17*
    The Debate on Indonesia's "Hollow" Age Groups *22*
    Correction and Interpretation of 1971 and 1976 Age Distributions *25*

3 MORTALITY *29*
  Mortality Levels and Trends *30*
    Child Mortality *30*
    Infant Mortality *30*
    Adult Mortality *35*
    Growth-Balance Applications *36*
    The 1971–80 Intercensal Period *41*
  Life Tables *47*

4 NUPTIALITY *53*
  Methodology *54*
  Age at First Marriage *54*
  Marital Disruption and Remarriage *60*
  Conclusion *64*

5 FERTILITY 67
  "Own-Children" Fertility Estimates 67
  Fertility Trends in the 1960s 71
  The Indonesian Fertility Survey (IFS) 76
  Children Ever Born, SUSENAS, 1979 79
  The 1980 Census 80
  The Fertility Trend 81
  Contraceptive Prevalence 83

REFERENCES 85

GLOSSARY 89

LIST OF TABLES

S.1. Estimates of the Proportion of Children Dying before Exact Ages 2 and 5, by Region, Late 1960s and Early 1970s: Indonesia *2*

S.2. Expectations of Life at Age *x*, from Estimated Indonesian Life Tables for Males and Females, Mid-1970s: Indonesia *4*

S.3. Ages at Which 50 Percent of Urban and Rural Women Aged 20–24 Had Married, by Region, 1976 Intercensal Population Survey: Indonesia *5*

1. Population by Sex and Five-Year Age Groups, Census of 31 October 1961, Census of 24 September 1971, Intercensal Population Survey, Stage 1 (SUPAS I), 1 March 1976, and Census of 31 October 1980 (in 1,000s): Indonesia *16*
2. Population by Single Years of Age, 22 Provinces, Census of 24 September 1971 (in 1,000s): Indonesia *19*
3. Population by Single Years of Age, 22 Provinces, Intercensal Population Survey, Stage l (SUPAS I), 1 March 1976 (in 1,000s): Indonesia *21*
4. Comparison of Recorded and Corrected Age Distributions, 22 Provinces, Census of 24 September 1971 (in 1,000s): Indonesia *25*
5. Analysis of Corrected Age Distributions, 22 Provinces, Census of 24 September 1971 and Intercensal Population Survey, Stage 1 (SUPAS I), 1 March 1976 (in 1,000s): Indonesia *27*
6. Estimates of ${}_2q_0$ and ${}_3q_0$ Based on the 1971 Census Data and the 1976 Intercensal Survey, Trussell Method, and Estimates of ${}_5q_0$ Derived from ${}_2q_0$, Both Sexes, by Region: Indonesia *31*
7. Infant Mortality Rates, by Region, Derived from ${}_5q_0$ Estimates Shown in Table 6, Assuming West Model Life Tables: Indonesia *32*
8. Proportions of Births (per 1,000) Dying under Age 5, 1955–74: Indonesia *33*
9. Partial Birth and Death Rates from SUPAS II: Indonesia *39*
10. Partial Death Rates with SVRP Age-Specific Rates and SUPAS II Population Age Distribution: Indonesia *42*
11. Partial Death Rates Calculated from Survivorship from 1971 to the 1980 Census: Indonesia *43*
12. Partial Death Rates Estimated by Different Methods, Mid-1970s: Indonesia *44*

13. Proportions of Mothers and Fathers Surviving, by Age of Respondent, 1976 Intercensal Survey: Indonesia *46*

14. Measures of Mortality Derived from Information on the Survival of Parents: Indonesia *48*

15. Measures of Adult Survivorship from 1970s Life Table Compared with Orphanhood Estimates at True Locations: Indonesia *49*

16. Estimates of the Expectation of Life at Age 20 for Females, by Region, Based on Orphanhood Data (Eldest Child) from SUPAS II: Indonesia *49*

17. Selected Parameters from Life Tables Constructed for This Report: Indonesia *50*

18. Percentages Never Married, Females Aged 15–19 and Males Aged 20–24, by Region, 1971 Census, 1973 FM Survey, SUPAS I, and SUPAS II: Indonesia *55*

19. Ages at Which Percentages of Various Birth Cohorts of Women Had Married, FM Survey, SUPAS II, and SUPAS III: Java and Bali *57*

20. Ages at Which 50 Percent of Each Age Group Had Married, Urban and Rural Females, by Region, SUPAS II: Indonesia *59*

21. Percentages of Ever-Married Urban and Rural Women Aged 40–49 Who Had Married More Than Once, by Region: Indonesia *61*

22. Cumulative Percentages of Rural and Urban Women Divorced from First Marriages, by Duration of Marriage and Region, Marriage Cohorts of 1940–49, 1950–59, and 1960–69, FM Survey, 1973: Indonesia *63*

23. Percentages of First Marriages Ending in Divorce or Separation According to the Number of Years That Elapsed between the Marriage and the Survey Data, by Region, SUPAS III: Indonesia *64*

24. Average Numbers of Children Ever Born to Women Who Had Married for the First Time 15 Years or More before the Survey, by Number of Marriages and Region, FM Survey, 1973: Indonesia *65*

25. Proportions of Women Currently Married (Including Separated), by Age Group, 1971 Census and SUPAS I: Indonesia *66*

26. Age-Specific Fertility Rates, 1967-70, and Total Fertility Rates, 1967-70 and 1967-71, by Region: Indonesia *69*

27. Age-Specific Fertility Rates and Total Fertility Rates, by Region, 1971-75: Indonesia *72*

28. Duration-Specific Marital Fertility Rates of Women Aged 15–49, by Region, 1967-70 and 1971-75: Indonesia *74*

29. Cumulated Fertility up to Age 35 from the FM and SUPAS II Surveys, by Region: Indonesia *76*

30. Estimates of Total Fertility in Calendar Years from the Indonesian Fertility Survey, 1964-75: Java and Bali *77*

31. Mean Parities for Women as Reported in the Indonesian Fertility Survey (IFS), 1976, and the National Socio-Economic Survey (SUSENAS), 1979: Java and Bali *80*

32. Estimates from Reverse Survival, 1980 Census: Indonesia *81*

33. Estimates of Trends in Total Fertility: Indonesia *82*

LIST OF FIGURES

S.1. Regional Trends in the Proportion of Children Dying by Exact Ages 2 and 5, Late 1960s and Early 1970s, as Assessed from Two Major Data Sources: Indonesia *3*

S.2. Trends in Total Fertility Rates, 1967–78, and Trends in Contraceptive Prevalence, 1971–81, from Various Sources: Indonesia *8*

S.3. Regional Fertility Trends, 1967–70 to 1971–75: Indonesia *9*

1. Comparison of Five-Year Age Distributions, 1961, 1971, 1976, and 1980: Indonesia *18*

2. Single-Year Age Distributions, 22 Provinces, 1971: Indonesia *20*

3. Corrected Five-Year Age Distribution, 22 Provinces, 1971: Indonesia *26*

4. D_x = logit $(l-l_x)$–logit $(l-l_{xs})$, Various Life Tables: Indonesia *36*

5. Growth-Balance Estimates, SUPAS II Death Rates: Indonesia *38*

6. Growth-Balance Estimates from SVRP Death Rates: Indonesia *40*

PREFACE

The Committee on Population and Demography was established in April 1977 by the National Research Council in response to a request by the Agency for International Development (AID) of the U.S. Department of State. It was widely felt by those concerned that the time was ripe for a detailed review of levels and trends of fertility and mortality in the developing world. Although most people in the demographic community agreed that mortality had declined in almost all developing countries during the last 30 years, there was uncertainty about recent changes in mortality in some countries, about current levels of fertility, about the existence and extent of recent changes in fertility, and about the factors determining reductions in fertility.

In 1963, a Panel on Population Problems of the Committee on Science and Public Policy of the National Academy of Sciences published a report entitled *The Growth of World Population.* The appointment of that panel and the publication of its report were expressions of the concern then felt by scientists, as well as by other informed persons in many countries, about the implications of population trends. At that time, the most consequential trend was the pronounced and long-continued acceleration in the rate of increase of the population of the world, and especially of the population of the poorer countries. It was estimated in 1963 that the annual rate of increase of the global population had reached 2 percent, a rate that, if continued, would cause the total to double every 35 years. The disproportionate contribution of low-income areas to that acceleration was caused by rapid declines in mortality combined with high fertility that remained almost unchanged: The birth rate was nearly fixed or declined more modestly than the death rate.

Since the earlier report, however, the peak rate of growth in the world's population has apparently been passed. A dramatic decline in the birth rate in almost all the more developed countries has lowered their aggregate annual rate of increase to well below 1 percent, and the peak rate of increase has also apparently been passed in the less developed parts of the world as a whole. A sharp decline in fertility in many low-income areas has more than offset the generally continued reduction in the death rate, although the rate of population increase remains high in almost all less developed countries.

The causes of the reductions in fertility—whether they are the effect primarily of such general changes as lowered infant mortality, increasing education, urban rather than rural residence, or improving status of women, or of such particular changes as spreading knowledge of and access to efficient methods of contraception or abortion—are strongly debated. There are also divergent views of the appropriate national and international policies on population in the face of these changing trends. The differences in opinion extend to different beliefs and assertions about what the population trends really are in many of the less developed countries. Because births and deaths are recorded very incompletely in much of Africa, Asia, and Latin America, levels and trends of fertility and mortality must be estimated, and disagreement has arisen in some instances about the most reliable estimates of those levels and trends.

It was to examine these questions that the Committee on Population and Demography was established within the Commission on Behavioral and Social Sciences and Education of the National Research Council. It was funded for a period of five and one-half years by AID under Contract No. AID/pha-C-1161 and Grant No. AID/DSPE-G-0061. Chaired by Ansley J. Coale, the committee has undertaken three major tasks:

1. To evaluate available evidence and prepare estimates of levels and trends of fertility and mortality in selected developing nations;
2. To improve the technologies for estimating fertility and mortality when only incomplete or inadequate data exist (including techniques of data collection);
3. To evaluate the factors determining the changes in birth rates in less developed nations.

Given the magnitude of these tasks, the committee decided to concentrate its initial efforts on the first two tasks; it initiated work on the third task in 1979.

By 1982, 168 population specialists, including 94 from developing countries, had been involved in the work or the committee as members of panels or working groups. The committee, the commission, and the National Research Council are grateful for the unpaid time and effort these experts have been willing to give.

The committee approached the first task through careful assessment, by internal and external comparison, and through analysis, by application of the most reliable methods known, of all the data sources available. Each of the country studies therefore consists of the application of a range of methods to a number of data sets. Estimates of levels and recent trends judged to be the best that were feasible with available resources were then developed on the grounds of their consistency and plausibility and the robustness of the individual methods from which they were derived.

The committee's second task, refinement of methodology, was seen as a by-product of achieving the first. The application of particular methods to many different data sets from different countries and referring to different time periods inevitably provided valuable information about the practical functioning of the methods themselves. Particular data sets might also require the development of new methodology or the refinement of existing techniques.

The third task of the committee, evaluation of factors determining birth rates, was the most difficult. Research on the determinants of fertility change has been carried out by scholars from several disciplines, and there is no comprehensive accepted theory of fertility change to guide the evaluation. Because of this state of knowledge of the causes of reductions in fertility and the difficulty of the task, the committee and the Commission on Behavioral and Social Sciences and Education established the separately funded Panel on Fertility Determinants, which included scholars from anthropology, demography, economics, epidemiology, psychology, sociology, and statistics. Three committee members served on the panel.

This report, on levels and recent trends of fertility and mortality in Indonesia, was to be Report No. 29 in a series of reports issued by the Committee on Population and Demography. It is the result of work by the Panel on Indonesia, created by the committee and the Commission on Behavioral and Social Sciences and Education in 1978. The panel met twice and also sponsored a workshop in Bali, Indonesia, at which several papers were presented and discussed. The Indonesian members of the panel were particularly helpful with the organization of this workshop. In addition to all panel members, the workshop participants included several scholars and officials from Indonesia.

Drawing upon the papers prepared for the workshop and more recent materials including available data from the 1980 census, initial draft sections of this report were written by panel members and staff. Subsequently, Geoffrey McNicoll reorganized and revised these sections into a draft report. Then, in the summer of 1983, Griffith Feeney and William Brass, a member of the Committee on Population and Demography, reworked the fertility and mortality sections at the East-West Population Institute. Finally, in 1984, data from the 1980 census became available for the calculation of additional fertility estimates, and panel member Si Gde Made Mamas arranged for the preparation of necessary tabulations for inclusion in this report. Throughout this process, Robert J. Lapham provided staff support for the panel.

The Committee on Population and Demography, which commissioned this report, disbanded after completion of the larger project of which this report was a part. Not all of the reports that the committee had scheduled could be completed within the original timetable due to delays in data availability or published tabulations. It is a credit to the members of the Panel on Indonesia that they continued to work on this report after their obligations officially ended.

Even after the report had been completed, a shortage of funds made publication impossible. The committee and the Panel on Indonesia are particularly grateful to the East-West Population Institute for supplying the resources needed for publication. The Committee on Population was established as a successor to the Committee on Population and Demography. The members of the new committee are pleased to issue this report and to thank their colleagues on the Panel on Indonesia and the Committee on Population and Demography for their work on the report.

The committee is grateful to the many organizations and individuals who have contributed to this report. In Indonesia, the Central Bureau of Statistics provided necessary data for estimating fertility and mortality, and the National Family Planning Coordinating Board provided information for the calculation of contraceptive prevalence estimates. In addition, the Central Bureau of Statistics provided computer tabulations and other materials. The East-West Population Institute, The Population Council, and The Australian National University assisted by supporting the volunteer panel members at these institutions and by providing computer time and secretarial support. Support for publication of this report was provided in part by the Office of Population, U.S. Agency for International Development, under a cooperative agreement with the East-West Population Institute.

Several individuals assisted with the many report production details. Lucy Santiago typed the text and tables at the Academy. Rona Briere and Sandra Ward edited the report, and Elaine McGarraugh, once again, applied her skills to the production-editing details. The committee extends its gratitude to these individuals and institutions for their contributions to the project.

Albert I. Hermalin, Chair
Committee on Population

SUMMARY

With an estimated 162 million inhabitants in 1984, Indonesia ranks fifth in population size among all countries and third (after China and India) among the less developed countries. Moreover, during the recent period of rapid economic change and government activity in many spheres, including population and health, considerable uncertainty has surrounded estimates of population trends in Indonesia. However, with an expansion of the empirical record in recent years, especially since the mid-1970s, the range of uncertainty has been narrowed.

The principal sources used to construct the estimates presented in this report are the 1961, 1971, and 1980 Population Censuses, the 1973 Fertility-Mortality Survey, and the 1976 Intercensal Population Survey (SUPAS) which included the Indonesian Fertility Survey in Java and Bali. Drawing upon and with further analysis of this data base, this report describes the levels and trends in mortality, nuptiality, fertility, and use of contraception in Indonesia. The context for these trends has been the establishment of a new political order in 1966–67 that led to a strong, development-minded government, followed by economic stabilization measures, an inflow of foreign aid, and the OPEC oil price surge. Among many measures enacted to spur economic growth and social development, the government made a strong policy commitment to reduce fertility, and quickly translated this into a vigorous family planning program that during the 1970s gradually increased its coverage throughout the country after beginning in the populous islands of Java and Bali. Other social policies were translated into programs to increase educational attainment, reduce child mortality, and to a lesser extent increase age at marriage. Together, these political, economic, social, and cultural changes, coupled with the widespread availability of the means of effective fertility control provided by the family planning program, have contributed to the declines in fertility and mortality described below. A companion report in the committee series presents a detailed discussion of these influences (see *Fertility Decline in Indonesia: Analysis and Interpretation,* National Academy Press, 1983).

Mortality

Data limitations, including the absence of a complete or nationally representative vital registration system, preclude exact measurements of child, infant, and adult mortality. Nevertheless, the application of various indirect estimation techniques makes possible the construction of estimates.

Child and infant mortality. Table S.1 presents estimates of the proportions of children dying by exact age 2 and exact age 5 for Indonesia, Java, and the islands outside Java. Although the data sources are the 1971 cen-

Table S.1. Estimates of the Proportion of Children Dying before Exact Ages 2 and 5, by Region, Late 1960s and Early 1970s: Indonesia

	Proportion dying by exact age			
	Two ($_2q_0$)		Five ($_5q_0$)	
Region	1971 census (mid-1969)	1976 SUPAS (late 1973)	1971 census (mid-1968)	1976 SUPAS (late 1972)
Indonesia	.18	.14	.21	.16
Java	.18	.14	.21	.17
Jakarta	.15	.11	.19	.12
West Java	.21	.17	.25	.21
Central Java	.17	.13	.21	.15
Yogyakarta	.12	.11	.13	.12
East Java	.15	.13	.18	.15
Outside Java	.18	.13	.22	.16
Sumatra	.18	.12	.21	.13
Kalimantan	.18	.12	.21	.13
Sulawesi	.19	.14	.22	.17
Bali	.15	.12	.19	.14
Other islands	.23	—	.27	—

Source: Table 6.

sus and the 1976 Intercensal Population Survey, the estimates refer to the late 1960s and early 1970s. In that period, child mortality declined rather substantially, but remained at high levels. For example, around 1968–69 about 18 percent of children died before reaching a second birthday, and more than one in five (21.3 percent) did not see a fifth birthday. These proportions declined to roughly 14 and 16 percent in the early 1970s. Because of the possible undercounting of deaths in the 1976 survey, the actual declines may not be quite as much as indicated by these trends, but the decline is significant nevertheless. Note the regional variation in Table S.1: In the early 1970s, despite declining trends, about one in five children in West Java still died before age 5, compared with a little more than one in ten in Yogyakarta.

Recognizing that the degree of validity is lower for regional trends, Table S.1 and Figure S.1 suggest that mortality declines were greatest in Jakarta and Sumatra and lowest in Kalimantan, Yogyakarta (but low in comparison with other regions), and East Java. Overall, despite the uncertainties, it can be said with reasonable confidence that mortality up to the age of 5 was about 160 per 1,000 in the early to mid-1970s, having declined from 210 per 1,000 several years earlier.

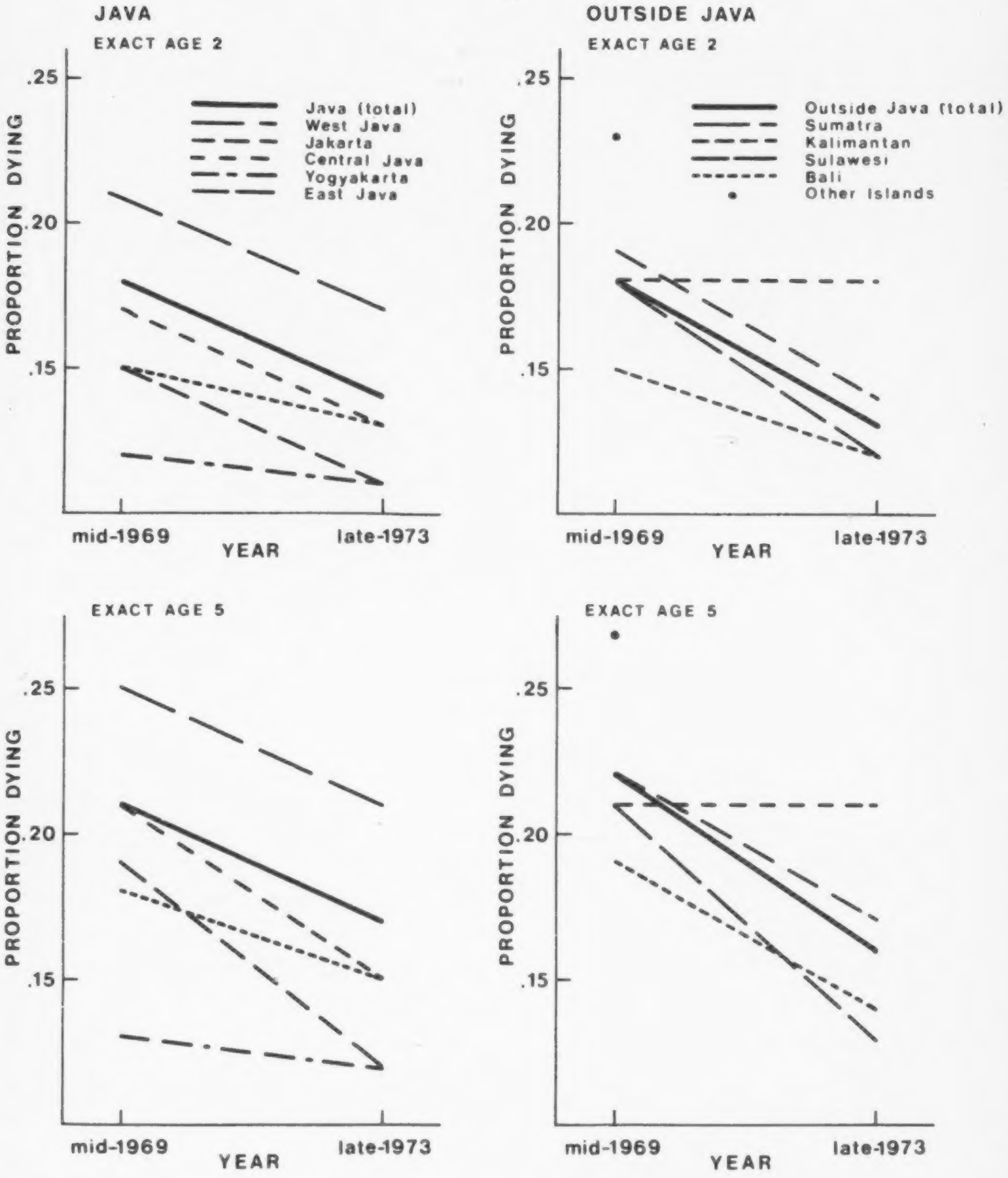

Figure S.1. Regional Trends in the Proportion of Children Dying by Exact Ages 2 and 5, Late 1960s and Early 1970s, as Assessed from Two Major Data Sources: Indonesia

Sources: 1971 census and 1976 Intercensal Survey; see Table 6.

Table S.2. Expectations of Life at Age *x*, from Estimated Indonesian Life Tables for Males and Females, Mid-1970s: Indonesia

	Expectation of life at age *x*	
Age	Males	Females
0	48.9	51.6
1	54.2	56.0
5	53.8	55.4
10	50.1	51.8
15	45.8	47.3
20	41.5	43.0
25	37.2	38.8
30	33.1	34.7
35	29.0	30.8
40	25.2	26.9
45	21.6	23.1
50	18.2	19.3
55	15.0	15.8
60	12.3	12.9
65	9.8	10.3
70	7.7	8.1
75	5.9	6.2

Source: Table 17.

Turning to infant mortality, by using a pattern of relationships between child and infant mortality, estimates of the latter can be derived from the former. Given problems with the data, it is difficult to establish with any degree of certainty which of several available patterns of relationships pertains in Indonesia. Nevertheless, available clues and the application of indirect techniques to the data permit estimation: Infant mortality is estimated at about 105 for the early to mid-1970s, down from about 130 ten years earlier.

Adult mortality. Conclusions about the levels and trends in adult mortality are even more uncertain, but they are presented as the results of demographic detective work and the application of several techniques including growth-balance and survivorship methods. The results are summarized in life tables for males and females as of the mid-1970s, from which the expectation of life at age *x* is presented in Table S.2. At birth, the expectation of life is about 50, slightly more for females and slightly less for males. Note that at ages 5 and 10, the expectation of life is greater for each sex than at birth, a reflection of the high levels of infant and child mortality.

Table S.3. Ages at Which 50 Percent of Urban and Rural Women Aged 20–24 Had Married, by Region, 1976 Intercensal Population Survey: Indonesia

Region	Total	Urban	Rural
Indonesia	18.3	20.5+[a]	17.9
Java	17.8	20.4	17.3
Jakarta	19.6	19.6	—
West Java	17.2	20.1	16.9
Central Java	17.7	20.5+	17.3
Yogyakarta	20.5+	b	20.5+
East Java	17.9	20.5+	17.9
Outside Java	19.3	20.5+	18.9
Sumatra	18.8	20.4	18.5
Kalimantan	18.7	20.5+	18.3
Sulawesi	20.4	20.5+	20.1
Bali	20.3	b	20.0
Other islands	20.0	b	19.6

a. For age group 20–24, the median frequency falls within the age group. This means that the ultimate median for this age group may still be affected by the future marriages of women aged 20–24. In these instances, the result has been written as 20.5+, except where the median is only a little greater than 20.

b. Unreliable because of small sample size.

Source: Table 20.

Nuptiality

As with the mortality measures, the various data sources do not provide fully consistent estimates of nuptiality. Nevertheless, the occurrence of fairly early age at marriage for females, with considerable regional variation, is apparent. The results from the 1976 Intercensal Population Survey are shown in Table S.3. Note that age at marriage for women is highest in Bali, Sulawesi, and Yogyakarta, with the median age exceeding 20 for rural women aged 20–24 in 1976. The high age at marriage in Yogyakarta is the result of a strong upward trend over time; in the case of Bali, the median age at marriage has been high for a long time and may even have decreased slightly in recent years. In urban areas, a strong upward trend in marriage age is evident throughout Indonesia; the median age at first marriage now exceeds 20 in all urban areas, with the interesting exception of Jakarta, the capital and largest city of Indonesia.

In rural areas, there appears to have been little increase in age at marriage among women between ages 25 and 50 in 1976, with the major exception of rural Yogyakarta, and to a lesser extent Central and East Java.

However, data for rural women aged 20–24 in 1976 indicate a clear movement to a higher age at marriage. Finally, the urban–rural difference in age at marriage is much wider within than outside Java; in fact, for women aged 30–49 living outside Java, there was very little difference in age at marriage between rural and urban areas. Overall, it used to be that 50 percent of Indonesian women married before their seventeenth birthday. For women aged 20–24 in 1976, this age had risen to 18.3 years. Therefore, age at marriage is increasing, but slowly.

Turning to marital disruption and remarriage, using the 1976 Intercensal Population Survey, between 35 and 45 percent of women aged 40–49 in Java had married more than once. Outside Java, this proportion was much lower. Most of this remarriage would have occurred subsequent to divorce rather than widowhood. The lowest rates of multiple marriage occurred in Bali and the highest in West Java.

One important conclusion from this assessment, despite methodological reservations, is that changes in marriage patterns during the first half of the 1970s had little impact on fertility. This outcome may reflect the relative lack of emphasis on increased age at marriage in Indonesian population and social policy in comparison with the attention given to marital fertility.

Fertility

In addition to the data sources used to estimate mortality and nuptiality, initial tabulations from the 1980 census are available for the construction of fertility estimates. Two principal fertility estimation methods used in this report are the Cho–Graybill "own-children" procedure and adjusted reverse survival, which involve the backward projection of numbers of mothers and children within households to the time of each birth and aggregation over households, and taking into account necessary adjustments and imputation rules. In addition, the gross underenumeration of children under age 1, especially in the 1971 census, compels a grouping of the data into broader age groups, using ranges chosen to minimize age-heaping distortions. One result of such grouping is that the fertility estimates are centered on a period some years prior to the data collection date. Thus, even though the necessary tabulations from the 1980 census became available in 1984, the period to which the fertility estimates refer is 1976–78. Given the interest in the effects of Indonesia's family planning program on fertility over time, this delay of several years is unfortunate, but must be accepted as the result of data limitations and processing time frames associated with censuses.

With these and other limitations in mind, Figure S.2 presents various estimates of fertility trends. (Because the estimates refer to periods of several years, caution must be exercised in reading single-year estimates from this figure.) The picture is reasonably coherent. Total fertility was about 5.5 in 1967-70 and not much different back to the late 1950s. By 1971-75, it was around 5.2. In the late 1970s, the rate had fallen to perhaps 4.8, including an allowance for an expected decrease in infant mortality. A regular downward trend in fertility of a little over 1 percent a year is suggested.

The own-children estimates from the 1980 census are also shown in Figure S.2. The agreement between the own-children and the reverse-survival estimates is very close, although the pattern of change is somewhat different. For the two later periods, 1971-75 and 1976-78, the two estimates are essentially identical. For the earlier period, 1967-70, the own-children estimate is about 6 percent below the reverse-survival estimate. The own-children estimates thus confirm the overall picture of fertility change presented here.

The 1980 census age distribution estimates show a rapid fertility decline in the three years before the census. However, this may be due to a combination of omissions of very young children and age errors. Something similar occurred in the 1971 census, although the pattern was not exactly the same. In addition, it is now clear that the births in the two or three years preceding were considerably underreported in both the Indonesian Fertility Survey and the Fertility-Mortality Survey, presumably because of time location errors. This experience emphasizes the dangers of drawing conclusions about current fertility levels from such exercises; the data are not strong enough to determine whether the rate of fertility decline was accelerating in the late 1970s.

Regional patterns are of note, shown in Figure S.3 for the period from 1967-70 to 1971-75, using the Intercensal Population Survey estimates. Fertility levels varied by region prior to the onset of the fertility declines around 1970. Note in particular East Java and Sumatra, where the differential in the total fertility rate was 1.8 in each time period, both regions having declined by about 0.3 births.

The declines in fertility since the late 1960s, and the relatively minor contribution of age-at-marriage changes, have occurred during a period that experienced a substantial and rapid increase in the use of modern means of fertility control in Indonesia, especially in East Java and Bali, with the government family planning program the principal source of family planning supplies and services. Figure S.2 also shows the trends in contraceptive prevalence in Indonesia, based on service records and postulated user continuation rates (but roughly in agreement with independent survey estimates of contraceptive practice). This amount of change in fertility control is notable. These estimated trends in contraceptive prevalence lend another element of consistency to the general picture regarding fertility decline in Indonesia since about 1970.

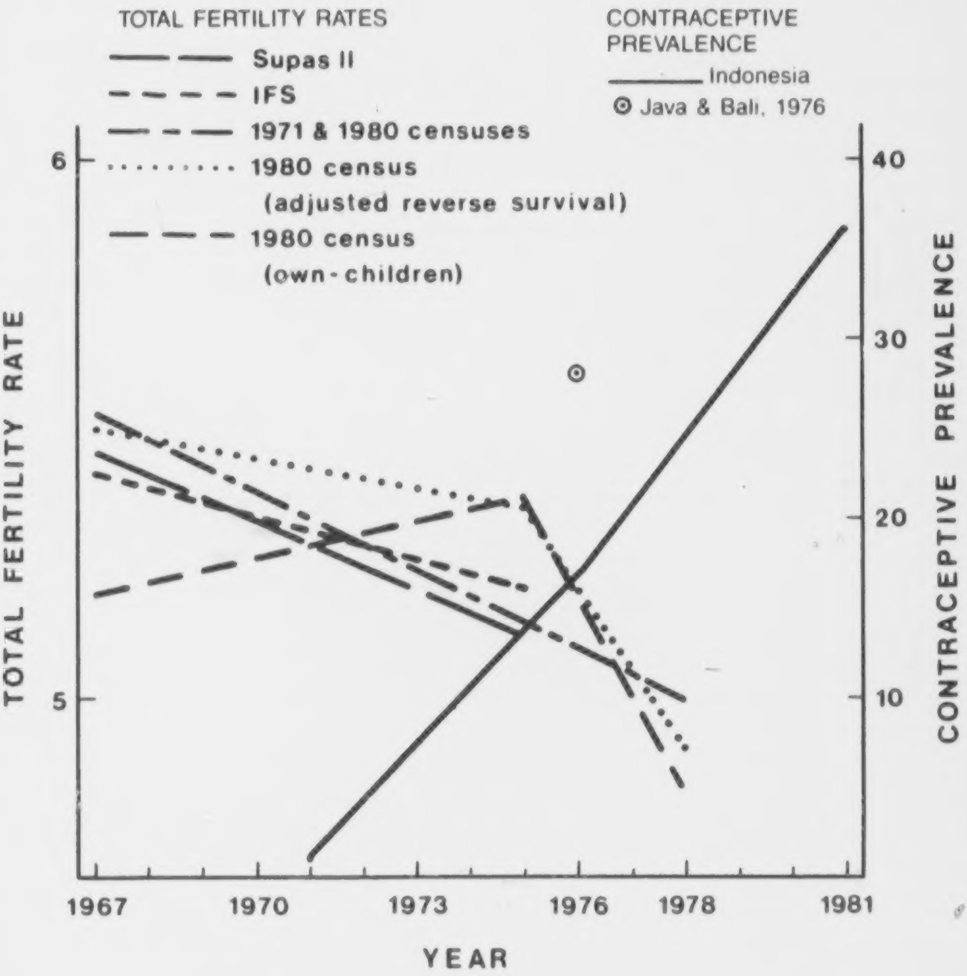

Figure S.2. Trends in Total Fertility Rates, 1967-78, and Trends in Contraceptive Prevalence, 1971-81, from Various Sources: Indonesia

Sources: Total fertility rates: Table 33; contraceptive prevalence, Indonesia, 1971-81: family planning program statistics; contraceptive prevalence, Java and Bali, 1976: World Fertility Survey data.

Notes: Contraceptive prevalence is the percentage of married women of reproductive ages (15-44) who were using contraception. Some of the TFR curves have been smoothed; see text (Chapter 5) for a discussion of how the estimates of total fertility were obtained.

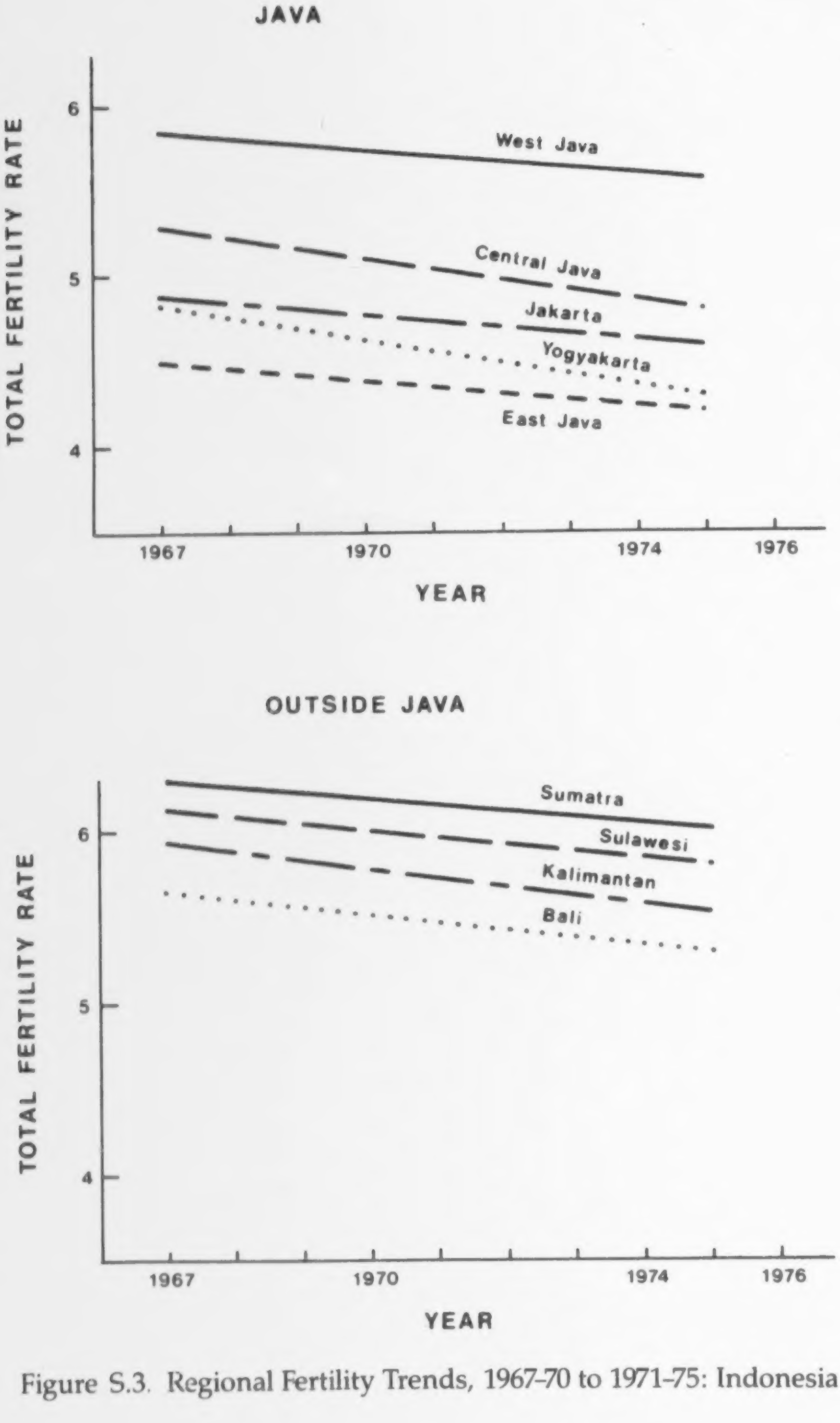

Figure S.3. Regional Fertility Trends, 1967–70 to 1971–75: Indonesia

1 INTRODUCTION

Purpose and Scope

The purpose of this study is to estimate the levels and trends of fertility and mortality for Indonesia using all relevant data sources. Both traditional and recently developed demographic techniques are employed. In addition to estimates for the country as a whole, fertility and mortality patterns for the major regions are discussed. The scope of this study does not include the determinants of the demographic trends revealed, which are addressed in the panel's report *Fertility Decline in Indonesia: Analysis and Interpretation* (National Academy Press, 1983). It does, however, include information on two of the proximate fertility determinants: nuptiality and prevalence of contraceptive use.

Background

Indonesia's recent and current demographic experience is the object of intense interest on the part of demographers and others concerned with population trends, both within the country and elsewhere. Part of this interest reflects Indonesia's sheer demographic weight in the world: With an estimated 162 million inhabitants in 1984, it ranks fifth in population size among all countries and third (after China and India) among the less developed countries. More particularly, there is interest in the possible demographic consequences of the period of rapid economic change and of government activity in the spheres of population and health described below. At the same time, considerable uncertainty has continued to surround estimates of population trends in Indonesia. This uncertainty has permitted a range of demographic pictures to co-exist, each with some basis in the empirical record; only in the last few years has the data base expanded enough to narrow this range.

In general, Indonesia's fertility has declined significantly since the 1960s, with total fertility (the number of children born to a woman over her reproductive life under prevailing fertility patterns) declining from about 5.5 in 1967-70 to about 4.7 for 1976-79 (based on the 1980 census). The backdrop for this change was the establishment of a new political order in 1966-67 following years of increasing conflict. The stronger, more stable government that resulted introduced successful economic stabilization measures; these were followed by an export recovery, a renewed inflow of foreign aid, and the OPEC oil price surge. The result was Indonesia's first period of rapid economic growth since the early 1950s, accompanied by a profusion of imported consumer goods and greater exposure to Western cultural influences. The government also made a policy commitment to lower fertility; this was translated into a vigorous family planning program that included a distribution network for modern contraceptives and campaigns to promote their use. There were also continuing trends in improving literacy and average educational attainment, declining (though still high) child mortality, and an increase in average age at marriage. Together, these political, economic, social, and cultural changes have contributed to Indonesia's fertility decline. The reader is referred to the report cited above *(Fertility Decline in Indonesia)* for a detailed discussion of these influences.

Organization of This Study

The next chapter of this study describes the major sources of the fertility and mortality data available for Indonesia; it also addresses the question of age distribution data, errors which must be considered in the estimation of fertility and mortality. This is followed by chapters on mortality, nuptiality, and fertility and contraceptive prevalence.

2 DATA SOURCES AND AGE DISTRIBUTION ANALYSIS

This chapter discusses the major data sources used in this report, including censuses, surveys, and a sample vital registration project. Because of the importance of age distribution analysis for assessing data quality and for the application of indirect estimation techniques, the chapter also analyzes Indonesian age distribution data.

Data Sources

The major sources of data for estimates of fertility and mortality in postwar Indonesia are the 1961, 1971, and 1980 Population Censuses, the 1973 Fertility-Mortality Survey, and the 1976 Intercensal Population Survey. These are described briefly below. The 1974-77 Sample Vital Registration Project also provides some useful comparative data. In general, however, despite a long history of formal registration requirements, vital statistics remain seriously incomplete and offer little basis for estimation; the various rounds of the multipurpose National Socio-Economic Survey (SUSENAS) have also not proven a reliable source of demographic information.

1961 Population Census. This census, taken in October 1961 following a household listing in March, covered the whole of Indonesia within its present boundaries, except for Irian Jaya and East Timor. (The official 1961 census figure for total population, 97.0 million, includes an estimate of 700,000 persons for Irian Jaya.) Ninety percent of the rural returns were hand-processed in the regional statistical offices, but for only a small number of characteristics (not including age). Urban returns and a 10 percent sample from rural areas were to be machine-processed in Jakarta. However, this work was delayed and ultimately halted by the economic and political turmoil of the mid-1960s, by which time provincial tabulations had been completed only for Jakarta, Yogyakarta, and East Java. Thus, the only available data from this census for the whole of Indonesia come from preliminary tabulations based on an initial hand count and processing of a 1 percent sample of the returns, taken in 1962 to provide some early results for planning purposes. These data provide only aggregated age distributions (five-year groups up to age 25, ten-year groups at higher ages), and do not include information on children ever born or still living. Virtually none of the unpublished census materials held by the Central Bureau of Statistics survived the decade (the main exception being village totals in Java, disinterred and published by the Population Institute of Gadjah Mada University in the late 1970s). See Widjojo (1970) for a discussion of this census and its findings.

1971 Population Census. A household listing was made in July 1970 and a two-stage enumeration carried out in September–October 1971. The first stage was a complete enumeration using a simple form asking only for broad age group, sex, and citizenship; the second stage was a sample enumeration (with an overall sampling fraction of 3.8 percent) using both a household and an individual questionnaire. The census covered all of present Indonesia except East Timor (annexed in 1976), whose population in a 1970 Portuguese census came to 609,000. The 1971 census data were published by the Central Bureau of Statistics in 26 province reports. Detailed census-based fertility and child mortality estimates derived from "own-children" tabulations and retrospective child survivorship rates are presented and analyzed in Cho et al. (1976, 1980); a description of the census is given in Suharto et al. (1976).

1980 Population Census. This census, conducted in September–October 1980, followed the broad design of the 1971 census, with a complete and sample enumeration. A preliminary total count, 147.4 million, was issued at the end of 1980. Full results were not available prior to preparation of this report, which draws on only the total counts for Indonesia and its major regions, the census age distribution, and some own-children fertility estimates.

1973 Fertility–Mortality Survey. Undertaken by the Demographic Institute of the University of Indonesia, this survey was administered to a sample of 54,000 households in Java, Sumatra, Sulawesi, and Bali (some 86 percent of the total population of Indonesia). Directed specifically at estimation of fertility and mortality, it included a detailed pregnancy history, as well as questions on knowledge and practice of family planning. The organization and major findings of this survey are reported in McDonald et al. (1976).

1976 Intercensal Population Survey. Usually referred to by its Indonesian acronym SUPAS (Survey Penduduk Antar Sensus), this was a major enterprise involving a three-round survey directed by the Central Bureau of Statistics. The first round, SUPAS I, sought basic information on household size and composition for a large sample (257,000 households, covering all regions). SUPAS II collected more detailed demographic and socioeconomic information from a subsample of the original sample (60,000 households, also covering the whole country). This was the most comprehensive part of the undertaking; the topics covered included economic characteristics of the household and its members, marital and divorce history, fertility experience and desire for additional children, contraceptive knowledge and practice, and population movement. Finally, SUPAS III, sometimes called the Indonesia Fertility Survey (IFS), used an adaptation of the World Fertility Survey core questionnaire; it was based on a sample of 10,000 households drawn from the first-round listing, but in Java and Bali only. The sample scheme and questionnaire details for the whole Intercensal Population Survey are described in Indonesia, Biro Pusat Statistik (1976). Preliminary results of SUPAS I can be found in Suharto and Cho (1978); results of SUPAS III have been distributed in various World Fertility Survey publication series, and most notably as the Indonesia Fertility Survey Principal Report (see Indonesia, Biro Pusat Statistik, 1978).

1974–77 Sample Vital Registration Project. This project was undertaken by the Central Bureau of Statistics (in collaboration with the National Family Planning Coordinating Board) over 1974–77, with a primary goal of assessing the completeness of the existing vital registration system and recommending improvements. (Average completeness of registration in the sample areas, covering each of the major regions of Indonesia, was estimated to be 56 percent for births and 64 percent for deaths.) A second aim of the project was to estimate fertility, mortality, and population growth rates in the project areas, based on a dual-record system (continuous registration and retrospective household surveys) operated over the life of the project. Although the resulting estimates cannot serve as representative national or regional data, in the present report the mortality age pattern derived from this source is used for comparison purposes. Details and findings of the project may be found in Indonesia, Biro Pusat Statistik (1979).

Age Distribution

Age distribution analysis is significant in two ways: It provides a general impression of data quality, and it serves as a preliminary to producing indirect estimates of fertility and mortality that are derived wholly or partly from age distribution data. In this section we assess the quality of Indonesian age data, chiefly by examining the consistency of successive national-level enumerations, and then develop corrected age distributions for use in the analyses presented in the chapters that follow. We take note in passing of the controversy that has surrounded this topic—in particular, the issue of whether the postwar census data, showing relatively smaller numbers among survivors of the 1940s birth cohorts than among neighboring cohorts, were a true reflection of prevailing conditions in that decade or merely resulted from later enumeration errors.

Indonesian age distributions are available for 1961, 1971, 1976, and 1980. The population boundaries were essentially identical for the 1961 and 1971 distributions, derived from the censuses of those years, except for Irian Jaya, which was not enumerated in 1961. (An addition of 700,000 was made to the 1961 enumerated total to allow for this region, then under Dutch administration.) The 1976 distribution, however, comes from SUPAS I, which

Table 1. Population by Sex and Five-Year Age groups, Census of 31 Oc-
tion Survey, Stage 1 (SUPAS I), 1 March 1976, and Census of 31

	1961 census[a]			1971 census[b]		
Age group	Male	Female	Both sexes	Male	Female	Both sexes
0–4	8,462	8,580	17,042	9,653	9,508	19,161
5–9	7,684	7,639	15,323	9,577	9,295	18,872
10–14	4,318	3,861	8,179	7,326	6,902	14,228
15–19	3,834	3,874	7,708	5,643	5,748	11,391
20–24	3,452	4,339	7,791	3,556	4,405	7,961
25–29	3,821	4,852	8,673	4,033	5,009	9,042
30–34	3,513	3,690	7,203	3,664	4,230	7,894
35–39	3,298	2,956	6,254	4,019	4,061	8,080
40–44	2,422	2,408	4,830	3,003	3,026	6,029
45–49	1,913	1,759	3,672	2,399	2,248	4,647
50–54	1,646	1,725	3,370	1,888	1,947	3,835
55–59	870	795	1,665	1,074	1,061	2,135
60–64	1,027	1,056	2,083	1,034	1,189	2,223
65–69	401	404	805	535	586	1,121
70–74	394	425	819	491	570	1,061
75+	378	406	784	379	391	770
Not stated	60	57	117	4	4	8
Total	47,494	48,825	96,319	58,279	60,181	118,460

a. Irian Jaya excluded. Age data are from a 1 percent sample of returns. Revised 1961 census total is 96,385,348, or 97,085,348 including guess of 700,000 for Irian Jaya.

b. Age data are from advance tables (10 percent sample); revised 1971 census total is 119,208,229.

c. Coverage incomplete in three eastern provinces: Nusatenggara Timur, Maluku, and Irian

effectively excluded several eastern provinces of the country, and is therefore not directly comparable to the earlier sources. It can be made comparable if the four eastern provinces of Nusa Tenggara Barat, Nusa Tenggara Timur, Maluku, and Irian Jaya are excluded. Timor Timur, annexed in 1976, was covered by the 1980 census but not by any of the earlier enumerations. We designate the total population of Indonesia excluding these four eastern provinces and Timor Timur by the phrase "Indonesia 22 provinces."

The five-year age distribution data from the four sources are shown in Table 1 and plotted in Figure 1. The numbers for 1961 and 1971 refer to the total population of Indonesia, with the minor exceptions noted in the table, and the numbers for 1976 to the Indonesia 22 provinces subpopula-

tober 1961, Census of 24 September 1971, Intercensal Popula-
October 1980 (in 1,000s): Indonesia

1976 survey[c]			1980 census[d]		
Male	Female	Both sexes	Male	Female	Both sexes
9,621	9,309	18,930	10,874	10,423	21,297
9,309	8,987	18,296	10,891	10,448	21,338
8,104	7,755	15,859	9,181	8,527	17,707
6,592	6,938	13,530	7,553	7,807	15,360
4,771	5,111	9,882	6,011	7,055	13,066
3,853	4,429	8,282	5,643	5,757	11,400
3,646	4,045	7,690	4,044	4,164	8,208
3,885	4,174	8,059	4,213	4,379	8,593
3,148	3,210	6,358	3,664	3,793	7,457
2,875	2,711	5,586	3,029	3,152	6,181
2,081	2,192	4,273	2,732	2,705	5,437
1,583	1,590	3,173	1,730	1,678	3,407
1,189	1,318	2,507	1,568	1,677	3,245
677	795	1,472	815	907	1,722
513	611	1,124	693	845	1,538
481	546	1,028	692	841	1,533
28	15	43			
62,357	62,736	126,093	73,332	74,158	147,490

Jaya. Timor Timur (annexed in 1976) excluded (1980 population of excluded areas was 4,558,000).

d. Includes Simor Timur, with 1980 population of 555,000.

Sources: 1961: United Nations (1965:142-143; 1971: Indonesia, Biro Pusat Statistik (1972:3); 1976: Indonesia, Biro Pusat Statistik (1977:17); 1980: Indonesia, Biro Pusat Statistik (1983:18).

tion. Relatively little information is available from the 1961 census since final tabulations were completed for only three provinces. (At ages above 25 even the five-year age data for 1961 in Table 1 had to be interpolated from ten-year intervals.) The 1980 data were not available at the time of this writing. Hence we rely here mostly on the 1971 and 1976 data.

General assessment of age distribution quality. Single-year age data for 1971 are given in Table 2 and plotted in Figure 2. The plot shows extreme heaping on multiples of 5 from age 20 onward, as well as less pronounced but clearly spurious responding at intermediate ages. Myers's index of digit preference provides a useful summary measure of the extent of heaping.

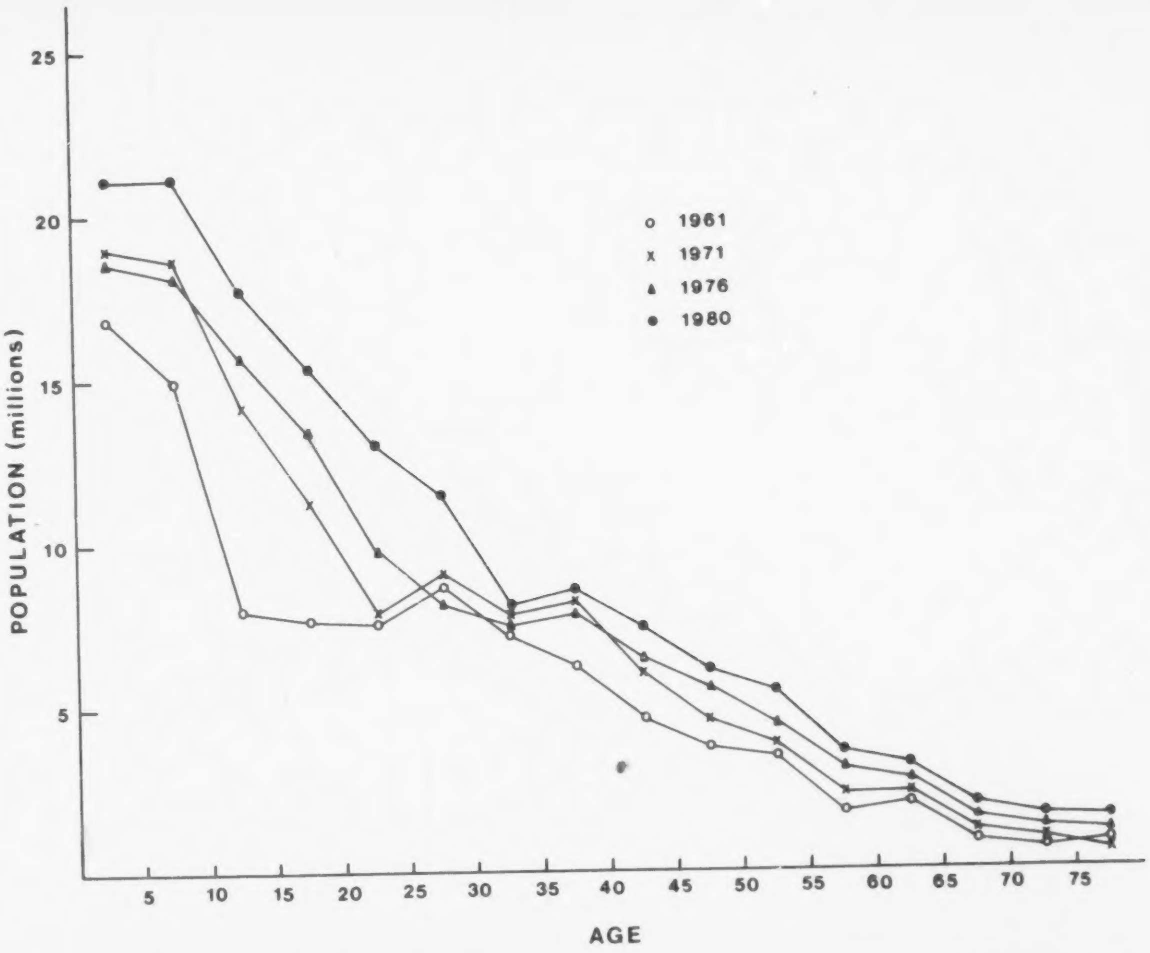

Figure 1. Comparison of Five-Year Age Distributions, 1961, 1971, 1976, and 1980: Indonesia

Source: Table 1.

Table 2. Population by Single Years of Age, 22 Provinces, Census of 24 September 1971 (in 1,000s): Indonesia

	Population at indicated age					
Age x	$x, x + 5$	x	$x + 1$	$x + 2$	$x + 3$	$x + 4$
0	18,100	2,337	3,873	3,882	3,952	4,056
5	17,841	3,685	3,687	3,683	3,611	3,175
10	13,550	3,457	2,379	3,023	2,375	2,316
15	10,782	2,586	2,014	2,123	2,584	1,475
20	7,585	3,006	1,299	1,236	1,052	992
25	8,477	3,550	1,334	1,314	1,337	942
30	7,524	3,951	1,128	1,108	727	610
35	7,624	3,919	1,221	868	979	637
40	5,829	3,409	887	687	533	313
45	4,448	2,488	677	426	524	333
50	3,689	2,259	551	363	290	226
55	2,124	1,153	379	217	223	152
60	2,226	1,500	319	175	143	89
65	1,081	670	149	96	97	69
70	987	696	170	60	38	23
75	745	0	0	0	0	0
Not stated	15	0	0	0	0	0
Total	112,627	0	0	0	0	0

Note: The designation "22 provinces" refers to total Indonesia (26 provinces) less the four provinces of Nusa Tenggara Barat, Nusa Tenggara Timur, Maluku, and Irian Jaya. This subpopulation is considered for purposes of comparison with data from the 1976 Indonesian Intercensal Survey (SUPAS), which included only purposive, nonrepresentative samples in these four provinces.

Source: 1971 Census of Indonesia (24 September), Series E, Nos. 1-26 (26 volumes), Table 01, pages 1-4, in each volume.

It has a theoretical range from 0, for no heaping, to 90, if all ages were reported as ending with the same digit (such as 0); for example, the index had a value of 8 in the 1970 Philippine census, and 33 in the 1971 census of India.

Myers's index for the 1971 Indonesian census was 24 (males, 22; females, 25). There was an appreciable lessening in digit preference in the 1976 survey, with the index falling to 16 (note that in both 1971 and 1976, age heaping was more pronounced in Java than in other major regions of Indonesia).[1] The broad message is that the age distribution data for Indonesia are sub-

---

[1] Calculations of Myers's index are from Budi Utomo (1978). See also Alatas (1974).

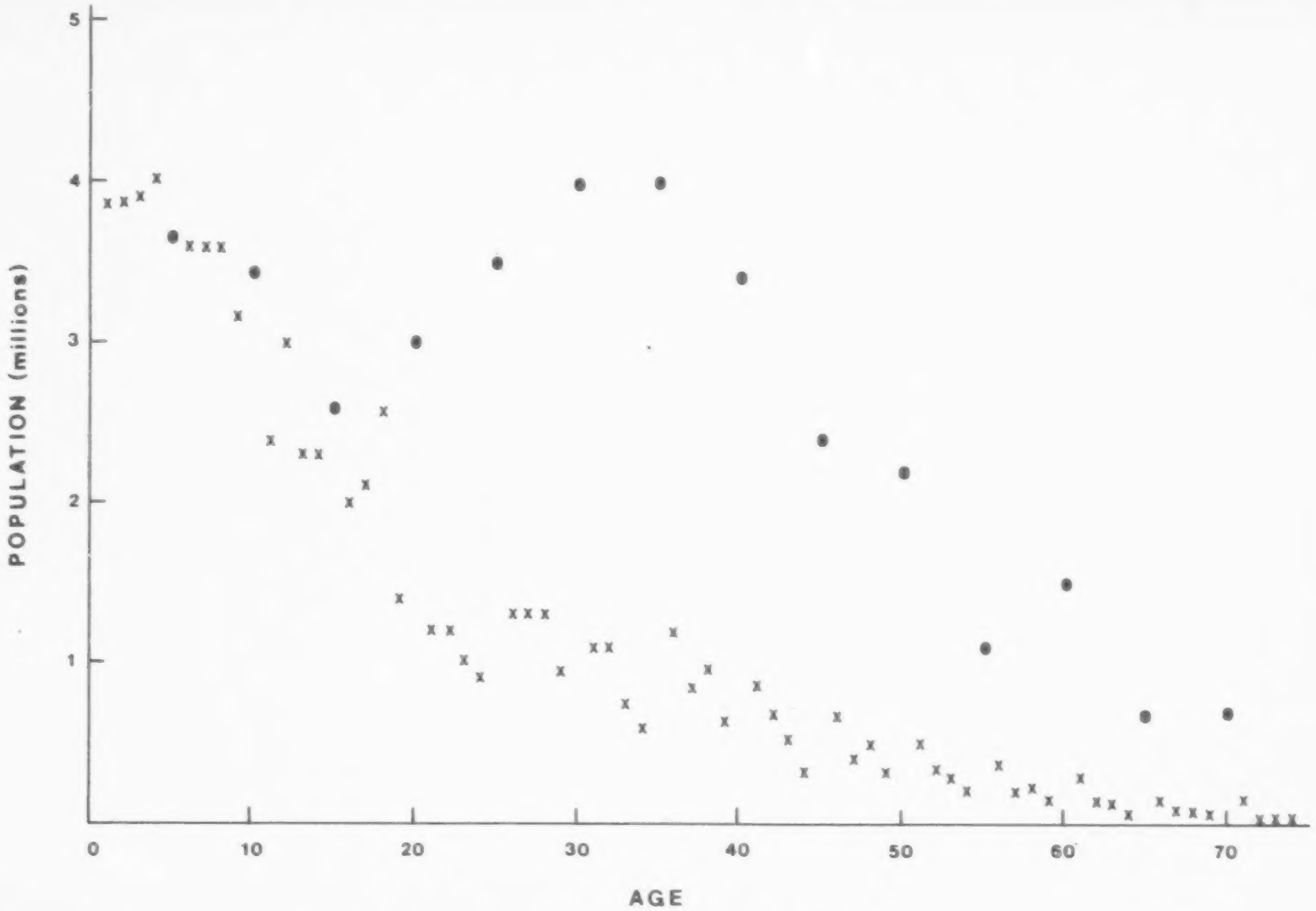

Figure 2. Single-Year Age Distributions, 22 Provinces, 1971: Indonesia

Source: Table 2.

Note: Multiples of 5 plotted as •; other ages plotted as x.

Table 3. Population by Single Years of Age, 22 Provinces, Intercensal Population Survey, Stage 1 (SUPAS I), 1 March 1976 (in 1,000s): Indonesia

	Population at indicated age					
Age x	$x, x + 5$	x	$x + 1$	$x + 2$	$x + 3$	$x + 4$
0	17,809	2,906	3,545	3,679	3,812	3,867
5	18,153	3,858	3,737	3,760	3,580	3,219
10	15,406	3,735	2,775	3,401	2,756	2,739
15	13,095	2,954	2,517	2,644	2,778	2,202
20	9,527	3,069	1,640	1,753	1,423	1,642
25	8,305	3,042	1,326	1,383	1,166	1,387
30	7,426	2,964	965	1,193	957	1,346
35	8,055	3,217	1,213	1,172	1,134	1,319
40	6,356	2,961	874	944	712	865
45	5,345	2,399	755	678	673	841
50	3,999	1,953	536	538	399	543
55	2,771	1,229	410	344	314	474
60	2,364	1,348	289	261	204	262
65	1,357	713	152	153	130	208
70	1,074	655	117	114	74	113
75	456	267	69	25	30	44
80	441	0	0	0	0	0
Not stated	131	0	0	0	0	0
Total	122,050	0	0	0	0	0

Source: Compiled from unpublished tabulations, East-West Population Institute.

ject to considerable reporting errors and should be regarded with more than usual skepticism.

The extent to which the five-year distributions are similarly affected is not clear from Figure 2, nor can it be discerned with any confidence in the plots of the five-year distributions in Figure 1. However, the magnitude and pattern of survivorship ratios calculated from the 1971 and 1976 data in Tables 2 and 3 clearly show the errors to persist in the five-year age group data. An examination of age-specific sex ratios in successive enumerations also indicates persistent errors in the grouped data, showing a distinctive pattern over the age range that has remained more or less the same over the three enumerations during the period 1961–76.[2] Finally, the U.N. age–

---

[2] This pattern is characterized particularly by very low sex ratios (around 80–85 males per 100 females) in the age groups 20–24 and 25–29. Regional variation in age-specific sex ratios for 1971 is examined by Alatas (1974).

sex accuracy index gave a value of 53 for the 1971 census, depicting the grouped data as "quite unreliable."[3]

The debate on Indonesia's "hollow" age groups. The 1961 census showed an apparent deficit in the 1941–51 birth cohort (Table 1) that if genuine would have obviously important economic and demographic repercussions in the 1970s as the suddenly much larger cohorts born in the 1950s entered labor force and reproductive ages. This interpretation, made by Keyfitz (1964, 1965), was challenged by van de Walle (1966) and Coale and Demeny (United Nations, 1967) on the grounds that almost identical age patterns found in Tropical Africa could be fairly confidently attributed to age-reporting errors. Their evidence was necessarily circumstantial when applied to Indonesia, but nonetheless striking. For females, the suggestion was that biases introduced when enumerators have to guess respondents' ages lead to the systematic inflation of ages for women just past puberty. For males, the explanation for misstatement of age was less clear, but the deficit to be accounted for was in any case smaller. An obvious phenomenon that would depress recorded early-adult sex ratios, also held to be widespread, is underenumeration of young males.

Debates on the reality of the "hollow" age groups similar to those that have taken place on Indonesia occurred in the African case. Van de Walle cites Sauvy on Madagascar as taking a view analogous to that of Keyfitz, for example. A careful analysis of the Tunisian case, revealing both real and spurious components in the observed deficit age groups, is given by Picouet (1969).

For Indonesia, the 1971 census was expected to settle the issue, but this was prevented by the continuing weakness of the age distribution data. SUPAS provides further evidence, particularly SUPAS II and III, in which unusual efforts were devoted to gathering accurate age information.[4] Plausibly, there is now a large enough body of data to resolve the Indonesian case without recourse to analogies with the experience of other countries.

The existence of a real deficit in the generation of Indonesians born in the 1940s is supported by what is known of economic conditions over 1930–50. In Indonesia, the 1930s was a time of severe depression in the export sector (a major part of the economy) and only partial recovery later in the decade. In Western countries this depression period saw lowered fertility; in the Indonesian case, most analysts have assumed that much of the population was insulated within the subsistence economy, and hence that demographic trends were little affected.[5] However, evidence from the analysis of the 1971 and 1976 age distributions presented later in this chapter suggests that fertility (net of child mortality) may indeed have been falling in the 1930s.

---

[3] U.S. Bureau of the Census (1979). The index measures "irregularities" in five-year grouped age distributions, and is calibrated as follows: under 20, reasonably reliable; 20–40, fairly unreliable; over 40, quite unreliable. For Stage I of the 1976 Intercensal Population Survey, the index was 35 (Budi Utomo, 1978).

[4] Such efforts cannot, of course, overcome the basic ignorance by respondents of their own and family members' ages that underlies much of the problem, but a high consistency of responses does reassure against gross enumerator errors. The World Fertility Survey reliability assessment of SUPAS III found 78 percent of respondents reinterviewed reporting their ages consistently within a margin of two years (with consistency positively related to current age and education). See World Fertility Survey (1978).

Whatever the case, things were clearly worse in the 1940s. The collapse of the Dutch colonial regime in 1942, followed by three years of Japanese military occupation, caused severe disruptions. In Java, by 1945

> social and economic conditions had deteriorated rapidly under a combination of natural calamities, chaotic administration, and dislocations caused by the war. The harvest of 1944 was almost completely ruined by drought. The army-imposed economic policy of strict autarchy within each residency created great hardships . . . [food] deficit areas were especially hard hit . . . the military government's extravagant deficit spending drove the rupiah down to one-sixtieth of its value in three and a half years. (Anderson, 1972:11)

A harsh procurement system of enforced rice deliveries at low controlled prices was set up in 1943, and a forced labor program *(romusha)* in the same year. There was a widespread breakdown of health services and pest control programs (Anderson, 1972). Contemporary estimates of birth and death rates available for two residencies in Java (out of 17) show virtually zero natural increase in late 1943 and in 1944 as a consequence of both raised mortality and lowered fertility.[6] Outside Java, where presumably there was

---

[5] See Widjojo (1970) and McNicoll and Mamas (1973). The wide variety of attempts to estimate vital rates for the 1930s are summarized in the *Demographic Factbook of Indonesia*, chapters 2 and 3. Birth rate estimates cluster around a figure of 40 per 1,000; death rate estimates are more scattered, in the range of 20–30.

[6] These estimates for Pati and Kedu residencies in Central Java (areas where the prewar vital registration system was comparatively good) are given in a wartime Japanese report on food availability dated January 1945 (*The Problem of Rice,* 1966):

Residence and rate (per 1,000 per year)	1943, 4th qr.	1944		
		1st qr.	2nd qr.	3rd qr.
Kedu birth rate		31.5	32.4	25.8
death rate		29.5	33.9	39.2
Pati birth rate	22.0			
death rate	23.0			

The same source gives the 1939 birth rate of Pati as 38.6 per 1,000. The worst-affected *kabupten* (administrative areas) in these residencies were identified as Wonosobo, Purworedjo, and Kudus, where (annualized) quarterly death rates peaked at 53.7, 42.7, and 45.0 respectively. See Widjojo (1970:chapter 7) for a general discussion of vital rate estimates in the 1940s.

a greater reserve of resources, the demographic consequences of the war were probably less severe, although at least in Sumatra (administered jointly with Malaya) a similar food procurement policy was introduced.

Recovery from occupation economic conditions was slowed by the independence struggle against the reestablished Dutch administration during 1945–49, although the actual fighting was mostly in Java and not uniformly intense over these years. The likelihood would seem to have been a gradual return to prewar demographic patterns, but with marked regional differences in recovery rates. In the early 1950s, the Korean War boom in commodity prices benefited the Indonesian economy along with others in the region.

Careful analysis of the various postwar enumerations should permit the putative demographic effects of this history to be assessed. Widjojo (1961, 1970) made a pioneering effort to do so by constructing a synthetic 1960 age distribution (based on an assumed stable population in 1930 and a specified sequence of subsequent birth and death rates) to be set against the 1961 enumeration. More recently, using the now much-enlarged data base, Speare (1978) undertook a similar but more elaborate study directed specifically at assessing the quality of the 1971 and 1976 age data.

Essentially, Speare projects forward a 1930 stable population, separately by sex, and obtains synthetic distributions for 1961, 1971, and 1976. Assumptions on the pattern and trajectory of fertility and mortality are of course challengeable (but tested to some degree in retrospect).[7] He compares the synthetic and recorded distributions from various angles, such as stability over time of age-specific adjustment factors, plausibility of the reporting errors implied if the synthetic distribution is in fact approximately the correct one, and age-specific sex ratios.

Speare's reconstruction of Indonesian age distribution data (yielding age/sex-specific adjustment factors for the two censuses and SUPAS I and II) is one approach to deriving a consistent data set, reconciling a plausible trajectory of births and deaths with later population enumerations. It is designed to correct jointly for both age-misstatement and underenumeration errors. We would argue, however, that his method throws out too much of the information contained in the recorded age distributions, and that he thereby loses a valuable opportunity to use this information to detect the past sequence of fertility or child mortality. In the discussion that follows, we undertake a new and more conservative adjustment of the age distribution data and draw some inferences from it.

---

[7] One obviously weak assumption in this procedure, well-recognized by Speare, is choice of an age pattern of mortality. Speare, in excellent (almost universal) company, uses the Coale–Demeny West model. The synthetic distributions will be securely based only when substantially more information is available on Indonesian mortality.

Table 4. Comparison of Recorded and Corrected Age Distributions, 22 Provinces, Census of 24 September 1971 (in 1,000s): Indonesia

Age group	Number of persons		Difference	Percentage difference
	Recorded	Corrected		
0-4	18,100	18,004	+96	+1
5-9	17,841	17,351	+490	+3
10-14	13,550	14,018	-468	-3
15-19	10,782	10,927	-145	-1
20-24	7,585	8,837	-1,252	-17
25-29	8,477	8,145	+332	+4
30-34	7,524	7,823	-299	-4
35-39	7,624	7,029	+595	+8
40-44	5,829	5,748	+81	+1
45-49	4,448	4,326	+122	+3
50-54	3,689	3,289	+400	+11
55-59	2,124	2,415	-291	-14
60-64	2,226	1,794	+432	+19
65-69	1,081	1,197	-116	-11
70-74	987	982	+5	+1
75+	745	741	+4	+1
Not stated	15	0	+15	+100
Total	112,627	112,626	1	—

Note: See text for explanation.

Source: Recorded numbers from Table 2.

Correction and interpretation of 1971 and 1976 age distributions. The 1971 and 1976 distributions have been corrected with a procedure developed by Feeney (1979) and specifically designed to remove the effects of age heaping of multiples of 5. Table 4 shows the effect on the 1971 distribution of this procedure, which requires the single-year age distribution and therefore cannot be applied to the 1961 data. It will be observed that the procedure transfers substantial numbers of persons between five-year age groups. The plot of the corrected distribution, shown in Figure 3, suggests a deficit of persons in the 20-29 age group. A corresponding plot of the corrected 1976 distribution, not shown, suggests a corresponding deficit in the 25-34 age group, suggesting a deficit of births during the period beginning 30 and ending 20 years prior to the 1971 census, or approximately the years 1942-51.

The corrected distributions are further compared in Table 5, which shows survivorship ratios and age group ratios (ratios of numbers of per-

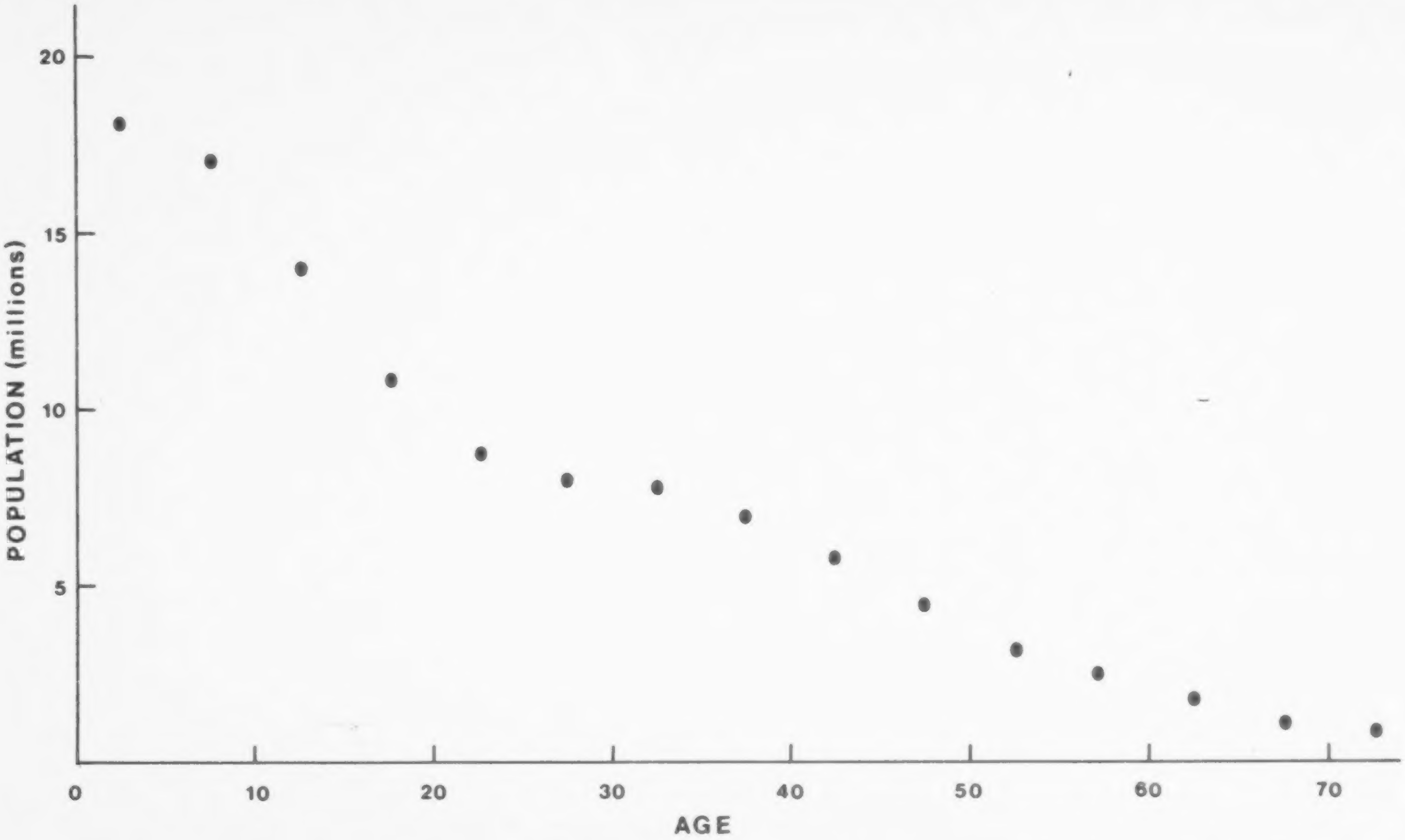

Figure 3. Corrected Five-Year Age Distribution, 22 Provinces, 1971: Indonesia
Source: Table 4.

Table 5. Analysis of Corrected Age Distributions, 22 Provinces, Census of 24 September 1971 and Intercensal Population Survey, Stage 1 (SUPAS I), 1 March 1976 (in 1,000s): Indonesia

Age group	Corrected age distributions		Survivorship ratio	Age group ratio	Time reference
	1971	1976			
0–4	18,004	17,827	—	0.99	1971
5–9	17,351	17,749	0.986	1.02	1966
10–14	14,018	15,621	0.900	1.11	1961
15–19	10,927	13,036	0.930	1.19	1956
20–24	8,837	10,342	0.946	1.17	1951
25–29	8,145	8,410	0.952	1.03	1946
30–34	7,823	7,820	0.960	1.00	1941
35–39	7,029	7,529	0.962	1.07	1936
40–44	5,748	6,485	0.923	1.13	1931
45–49	4,326	5,100	0.887	1.18	1926
50–54	3,289	3,909	0.904	1.19	1921
55–59	2,415	2,899	0.881	1.20	1916
60–64	1,794	2,128	0.881	1.19	1911
65–69	1,197	1,432	0.798	1.20	1906
70–74	982	886	0.740	0.90	1901
75+	741	887	—	—	—
Total	112,626	122,050	—	1.08	—

Note: Total for 1971 includes 15,000 age-not-stated cases.

Source: 1971 distribution from Table 4. 1976 distribution from unpublished tabulations, East-West Population Institute.

sons in corresponding age groups in the two distributions). The survivorship ratios are very much smoother than those calculated from the original data, which suggests that age-misreporting effects are attenuated (not eliminated) by the correction procedure.

The explanation for the gradual rise of the survivorship ratios with increasing age in the younger ages is unclear. It is virtually certain that it does not represent an unusual mortality pattern, and it seems highly unlikely that it could be an artifact of the correction procedure. It might be accounted for either by the time period separating the two distributions, which falls short of five years by about six months, or by ratios calculated from the recorded distributions. The relatively high ratio for the 0–4/5–9 groups probably reflects high underenumeration of the 0–4, relative to the 5–9 age group. Beyond this first value, the ratios rise, rather than fall as expected, over the next 35 years of age; thereafter, the ratios show a mildly erratic varying completeness of enumeration for different age groups.

The age group ratios in Table 5 are of particular interest. In a stable population, these ratios would be identical. More generally, in a closed population that has experienced constant mortality, these ratios would equal the ratios of births in successive five-year periods prior to the census. For example, if persons aged 50-54 at the end of 1971 and those aged 50-54 at the end of 1976 experience the same mortality risks, and if the corresponding birth cohorts experience no migration, then the ratio of persons aged 50-54 in 1976 and in 1971 equals the ratio of the number of births in 1922-26 and in 1917-21. Age group ratios may thus yield a time series of ratios of births in successive five-year time periods.

The age group ratios in Table 5 reflect several factors in addition to the time series of births, including the fact that the interval between the two studies (and thus the two age distributions) was not exactly five years plus migration, changing mortality, and errors in the corrected age distributions. Nonetheless, the pattern is remarkably suggestive. The ratios for age groups 45-49 through 65-69 are almost identical—around 1.2—suggesting a stable population 45 years prior to the 1971 cenus, with births increasing by a factor of 1.2 every five years. The deviant ratio for the 70-74 group can be dismissed because of the termination of the recorded age distributions with the 75+ age group, which does not permit transferring into the 70-74 group those misreporting their ages to 75. Moving up the column of ratios from the 45-49 age group, the decline from 1.13 to 1.07 to 1.00 suggests declining fertility at a slowly increasing rate during 1932-37, 1938-41, and 1942-47, with a low point reached during the last period. It must, of course, be conceded that the series may represent increasing infant and child mortality in conjunction with declining fertility, and that there is no simple way, and perhaps no way at all, to discern the relative contribution of each factor. Following the low period of 1942-47, and again in some indeterminant combination, fertility evidently rose and infant and child mortality fell, until the ratios of births in successive five-year periods nearly reached their pre-1932 values. The subsequent decline of the ratios naturally raises the question of whether crude birth rates during the 15 years prior to the 1971 census were falling as an echo effect of the decline that occurred a generation earlier.

3 MORTALITY

Because there is no national vital registration system in Indonesia, the available mortality data are primarily indirect in nature.

Sources available for estimating infant and child mortality include the following:

- Information on survival of the children of women in given age groups is available from the 1961 census (three provinces only); the 1971 census; the 1973 Fertility-Mortality (FM) Survey; and the 1976 Intercensal Survey (SUPAS), conducted in three phases.
- The age at death of children in given birth year cohorts is available from the pregnancy history data of the FM Survey and SUPAS III (the Indonesia Fertility Survey, or IFS).
- Respondents participating in SUPAS II were asked the date of birth, sex, and present survival status of their most recent birth.

Methods are available for converting all of these data to conventional measures of infant and child mortality.

Sources available for deriving estimates of adult mortality include the following:

- The three major enumerations—the 1961 and 1971 censuses and the 1976 Intercensal Survey—provide age structures from which adult mortality estimates can be made using intercensal survival techniques; the 1980 census age distribution has just become available for the same purpose.
- Information on deaths by age and sex occurring in a fixed retrospective period was collected in the FM Survey (deaths in a 12-month period) and SUPAS II (deaths in a two-year period). Together with the age distributions from these surveys, these retrospective data can be used to calculate age-specific death rates.
- In SUPAS II, respondents were asked whether their mother was still alive, whether their father was still alive, and whether they were the *anak pertama* (first child) of their mother. These data can be converted to conventional measures of adult mortality.

Finally, an additional source of mortality estimates is the Indonesian Sample Vital Registration Project (SVRP). Conducted in ten *kecamatan* (subdistricts) across Indonesia over a three-year period from 1974 to 1977, this project gathered information on deaths using two independent systems—continuous vital registration and a semi-annual survey. Using estimates of undercount and the recorded age structures, age-specific death rates can be determined directly from these data, although the sample of ten *kecamatan* cannot necessarily be taken as representative of all Indonesia.

Mortality Levels and Trends

Child mortality. All the available data on the survival of children, along with the various methodologies for converting these data to conventional childhood mortality measures, have been extensively examined in the Indonesian case by Hull and Sunaryo (1978). In their study, the most serious problems they encountered were as follows:

- The design of the questions on children ever born and still living has changed from enumeration to enumeration. In particular, the design used in SUPAS II may have led to undercounting of deaths, while that used in the 1971 census led to a high proportion of unstated responses on children ever born and still living.
- Age misstatement (by mothers) was severe and varied among the enumerations. At the same time, analysis of survivorship of children by single years of age of mother indicated that age misstatement errors were related to reported survivorship of children.
- The data on children ever born and still surviving in 1971 and 1976 suffer from substantial reporting errors, as is demonstrated by a comparison of cohorts of women at the two enumerations.

Hull and Sunaryo also point out that care should be taken in specifying the time to which retrospective estimates of child mortality apply.

The estimates of child mortality shown in Table 6 have not been adjusted in response to these problems and should therefore be interpreted with caution. Nevertheless, the table shows a definite downward trend in childhood mortality during the time periods to which the data relate (late 1960s to early 1970s). Hull and Sunaryo note that the observed decline for Indonesia may overstate the real situation because of the possible undercounting of deaths in 1976; the actual decline may have been on the order of 15–20 percent, rather than about 23 percent as shown in the table.

Table 6 also shows that regional factors weigh heavily in the determination of mortality. Particular regions stand out: Yogyakarta, East Java, and Bali have relatively low mortality, while West Java, Sulawesi, and the eastern islands ("other islands") have high mortality. Hull and Sunaryo have suggested that these differences may be traceable to the low level of malaria in Java, the use of low-nutrition staples in high-mortality areas, and the more widespread provision of health services in Java and Bali. Although regional trends in mortality may have a low degree of reliability, Table 6 suggests that mortality declines were most rapid in Jakarta and Sumatra, and slowest in Kalimantan, Yogyakarta, and East Java.

Infant mortality. Estimates of infant mortality can be obtained from the childhood mortality estimates given in Table 6 if the pattern of mortality

Table 6. Estimates of ${}_2q_0$ and ${}_3q_0$ Based on the 1971 Census Data and the 1976 Intercensal Survey, Trussell Method, and Estimates of ${}_5q_0$ Derived from ${}_2q_0$, Both Sexes, by Region: Indonesia

Region	${}_2q_0$		${}_3q_0$		${}_5q_0$	
	1971 census (mid-1969)	1976 SUPAS (late 1973)	1971 census (mid-1967)	1976 SUPAS (late 1971)	1971 census (mid-1968)	1976 SUPAS (late 1972)
Indonesia	.179	.137	.194	.150	.213	.163
Java	.176	.139	.191	.153	.209	.166
Jakarta	.154	.110	.173	.108	.186	.123
West Java	.208	.171	.226	.190	.248	.206
Central Java	.174	.125	.193	.146	.209	.153
Yogyakarta	.117	.108	.132	.096	.132	.116
East Java	.146	.125	.161	.135	.175	.147
Outside Java	.184	.133	.199	.144	.217	.157
Sumatra	.179	.117	.194	.126	.213	.129
Kalimantan	.179	.180	.196	.185	.214	.208
Sulawesi	.187	.142	.205	.155	.224	.169
Bali	.151	.123	.180	.133	.188	.145
Other islands	.231	—	.243	—	.271	—

Notes: ${}_2q_0$ and ${}_3q_0$ are based on the Trussell West model, and the derived values of ${}_5q_0$ assume West model life tables. The data in parentheses refer to the time to which the estimate refers. These estimates of *time* prior to the data collection date are derived by use of Trussell's t*.

Table 7. Infant Mortality Rates, by Region, Derived from $_5q_0$ Estimates Shown in Table 6, Assuming West Model Life Tables: Indonesia

Region	1971 census (mid-1968)	1976 SUPAS (late 1972)
Indonesia	.143	.112
Java	.140	.114
Jakarta	.126	.087
West Java	.166	.139
Central Java	.140	.106
Yogyakarta	.093	.082
East Java	.119	.102
Outside Java	.146	.108
Sumatra	.143	.091
Kalimantan	.144	.140
Sulawesi	.150	.116
Bali	.127	.101
Other islands	.181	—

in the first five years of life is known. The Princeton set of regional model life tables provides a wide range of mortality patterns under age 5; however, to use these tables, one must have some knowledge of which of the four families of tables is most likely to prevail in the society under study. Hull and Sunaryo have shown that the infant mortality rate derived through model life tables from the estimate of $_2q_a$ in Indonesia from the 1971 census data varies by 20 points per 1,000, depending on the model used.

A useful way of distinguishing among the childhood mortality patterns in the four families of regional model life tables is to examine the level of the $_1q_0/_4q_1$ against the implied level of 15. This procedure can be applied to data obtained from a small-scale reliable study, and the observed pattern then assumed to apply to the whole country. Unfortunately, the Indonesian data situation does not permit even this simple procedure to be applied with confidence. At best, the life tables produced by Gardiner (1978) from the SVRP show a pattern of mortality under age 5 very similar to that of the West tables. Gardiner warns that these data require further investigation because of problems involved in estimating the denominators at these ages. Nevertheless, given that the pattern of childhood mortality in the West tables falls between the patterns in the North and East tables, and that the small amount of data available for Indonesia also suggests use of the West tables, the infant mortality rates in Table 7 have been derived from the $_5q_0$ values in Table 6 on the assumption that the West pattern of childhood mor-

Table 8. Proportions of Births (per 1,000) Dying under Age 5, 1955–74: Indonesia

Year of birth	Infant mortality	Proportion dying, 1–4	Proportion dying up to 5
1955	118	120	224
1956	153	100	237
1957	118	113	218
1958	120	98	206
1959	112	91	193
1960	117	86	207
1961	108	91	188
1962	150	93	229
1963	119	92	199
1964	112	111	211
1965	115	88	193
1966	112	90	192
1967	103	59	156
1968	96	65	155
1969	106	68	162
1970	81	67	148
1971	84	63	141
1972	92	68	153
1973	105	—	—
1974	96	—	—

Source: Supraptilah (1982).

tality applies in all Indonesia. In interpreting these data, it must be remembered that the error involved merely in selecting a family of model life tables could be on the order of plus or minus 10 points per 1,000 around the values shown in the table.

From the IFS maternity histories (which refer to a sample of women in Java and Bali), mortality has been calculated for calendar years of birth (see Table 8). As one goes further back into the past, greater and greater selection occurs because births to women at higher ages are progressively excluded by the age 50 upper limit for women at the time of the survey; however, any bias should be small for the 15 years before. From Table 7 it can be noted that infant mortality in Java plus Bali was little different from that in Indonesia as a whole. The rates in Table 8 can then be taken as comparable with the previous estimates.

The survival of birth cohorts from 1967 onward shows little if any systematic trend, with an average infant mortality of 95 per 1,000 births and ${}_5q_0$ of 153 per 1,000 (${}_5q_0$ is a measure of the numbers of children dying by exact age 5). The corresponding measures for around 1972 shown previously are 112 and 163 per 1,000, although these latter measures include some contribution from children born before 1967. Given the different coverage and techniques, as well as the vulnerability of infant mortality rates to exact specification of the 12-month period, the agreement is reasonable. The sharp change in rates between the 1966 and the 1967 birth cohorts makes it more difficult to equate the different estimates. The IFS data give averages of 119 per 1,000 for infant mortality and 202 per 1,000 for ${}_5q_0$ over the 1961-66 cohorts compared with the mid-1968 estimates from Table 6 and 7 of 143 and 213. It appears that the discrepancy is in the pattern of childhood mortality. The age pattern of mortality assumed in the Coale-Demeny West model life table may be appropriate for the period before 1964. The IFS measures yield a fall in infant mortality of 20 percent and in mortality up to age 5 of 25 percent between the early 1960s and the late 1960s to early 1970s.

As noted above, the reliability of the rates becomes increasingly uncertain for earlier birth cohorts. Nevertheless, it is worth noting that indications are of little change back to the mid-1950s.

The 1973 FM Survey also produced estimates of mortality up to age 5 of birth cohorts. An exact comparison with the IFS results is not possible because the aim of the FM Survey was to establish basic measures separately for rural and urban areas within regions; in addition, both Jakarta and urban areas of Bali were excluded. However, the FM estimates can be weighted to be roughly equivalent to the IFS values, as follows:

	Proportion dying by age 5	
Birth cohort	FM Survey	IFS
1955-59	197	216
1960-64	167	207
1965-67	146	180

The IFS rates are somewhat higher than the FM measures, although the trends are similar. Because of the approximations involved in the comparison, too much weight should not be placed on the discrepancies; however, it seems safer to put more weight on the IFS measures in constructing Indonesian life tables.

It should also be noted that the estimates given in Table 7 refer to both sexes combined. In this regard, the life tables estimated from the Sample Vital Registration Project (Gardiner, 1978) indicate that sex differences in mortality in Indonesia, for both children and adults, were similar to those in the Princeton regional model life tables.

Based on the survival of children born in 1975 as reported in SUPAS II (March 1976), Hull (1978) has estimated that the infant mortality rate in Indonesia was about 114 per 1,000 births in 1975, an estimate in good agreement with the figure of 112 per 1,000 shown in Table 7 for late 1972. In summary, despite the uncertainties, it can be said with fair confidence that mortality up to age 5 in Indonesia was around 160 per 1,000 in the early to mid-1970s and 210 per 1,000 several to ten years earlier. The corresponding levels of infant mortality are less certain, but may be put at 105 per 1,000 and 130 per 1,000 for those time periods.

Adult mortality. The above relatively firm conclusions about the levels and trends of infant and child mortality cannot be matched by conclusions about adult mortality. Until recently, in the absence of data on adult mortality, researchers have estimated adult mortality based on one of the following: the figures implied by an estimate of childhood mortality and a set of model life tables; or the figures in a model life table which, when applied to the age distribution, yield the observed change in population between two enumerations. However, there is little basis for the assumption that the pattern of adult mortality of one of the standard families of model life tables applies to countries such as Indonesia. More recently, data have become available that permit research into the specific pattern of adult mortality applying in Indonesia.

Heligman (1974) and Kabir (1978) have applied intercensal survival techniques to the 1961 and 1971 Indonesian censuses. Both studies revealed a low childhood/high adult mortality pattern relative to the Brass General Standard mortality pattern (see Figure 4). Using similar methods, McDonald (1978b) has examined intercensal survival between 1961 and 1971 and between 1971 and 1976. While his results for both periods agreed on average with the patterns observed by Heligman and Kabir, he found that the survival patterns for individual age groups and for the two sexes differed considerably between the two enumeration periods. He concluded (p. 16) that the inconsistencies in age distributions between enumerations were so great that intercensal survival techniques applied to Indonesian data "add little to knowledge of the levels and patterns of adult mortality in Indonesia."

Life tables based on retrospective questioning about deaths occurring in the household in the 12 months prior to the 1973 FM Survey have been constructed by Sinquefield and Kartoyo (1977). The pattern they obtained, in reverse of those of Heligman and Kabir, shows relatively high childhood mortality, after which the mortality rates became increasingly lower with age relative to the Brass General Standard mortality pattern (see Figure 4). McDonald (1978a) has claimed that the pattern observed by Sinquefield and

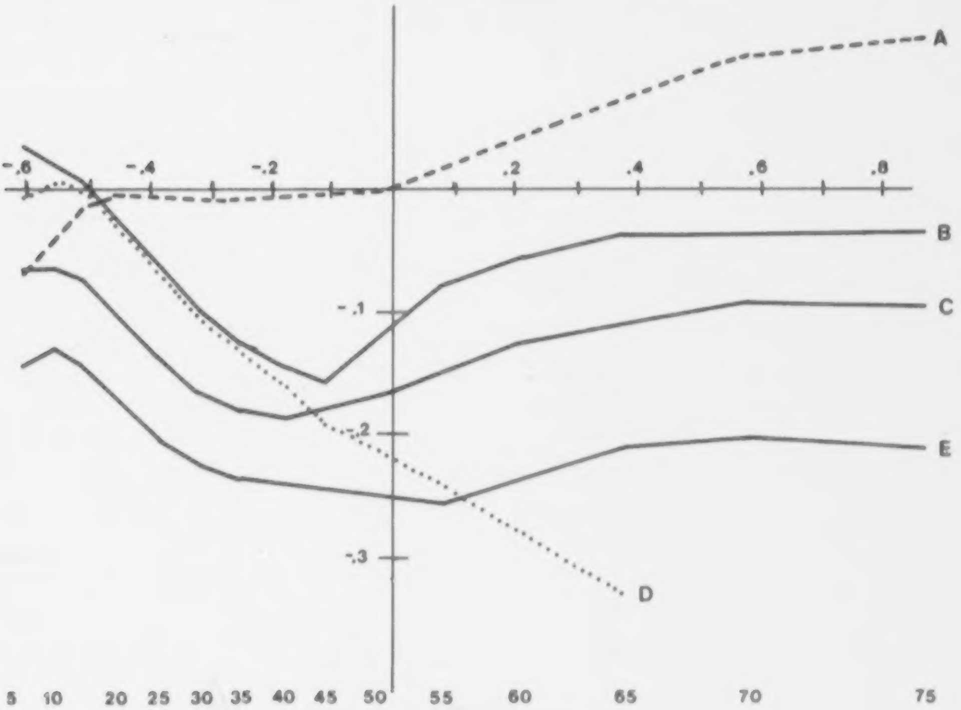

Figure 4. $D_x = \text{logit}\,(l-l_x) - \text{logit}\,(l-l_{xs})$, Various Life Tables: Indonesia

Sources: A: Heligman (1974), females, Indonesia, 1971.
B: McDonald (1978b), females, Indonesia, 1964.
C: Gardiner (1978), males, SVRP areas, 1974-77.
D: Sinquefield and Kartoyo (1977), males, rural Indonesia, 1965-70.
E: Gardiner (1978), females, SVRP areas, 1974-77.

Kartoyo is very strongly influenced by age differences in the level of reporting of deaths, specifically, that deaths after age 45 are likely to have been heavily and increasingly undercounted in the FM Survey. The information obtained from SUPAS II on deaths in the household in the two years prior to the enumeration have been examined by McDonald (1978b), who concludes that the data are of low quality because the understatement appears to be on the order of 50 percent.

Growth-balance applications. Despite the weaknesses of the SUPAS II mortality data, the paucity of information makes a closer examination of these data worthwhile. This can be done through the various versions of the growth-balance procedure. Although a number of alternatives have been tried, errors in the observations make the introduction of sophisticated adjustments unrewarding; therefore, only the results of the most simple approach are presented here.

From deaths by age in a year, the crude death rate for the section of the population aged x and over, d_x, can be calculated. The crude birth rate for this section, that is, the rate of entry per annum, b_x, is found easily from the average numbers per year around age x divided by the population over this age. If the growth rate of all sections is the same value, r, and deaths are in error by a constant proportion at each age, then $b_x = r + fd_x$, where f is the correction factor for the reported deaths. Since at older ages b_x and d_x are large relative to r, modest variations in the growth over time are not important. The method is extremely powerful for demonstrating the order of f, although age errors for both the living and dying, as well as differential reporting by age, can make accurate estimation of the correction factor difficult.

This method was applied to the SUPAS II reports of deaths in both 1975 and 1974. Although the correction factors were considerably larger for 1974, the characteristics of the checks and the final mortality estimates were very similar. Nor did the use of smoothed rather than observed age distributions of the living and dying appreciably alter the findings. Therefore, the discussion here will be only of the unsmoothed measures for 1975.

Figure 5 is of b_x against d_x separately for males and females. Although the relation is erratic, it is clear that the deaths would have to be roughly doubled to give consistency with the relation $b_x - d_x = r$. The adjustment required for females is somewhat larger than that for males. It is not easy to determine the best f because of the curvature of the points in the graph; this type of curvature, often found, is almost certainly due to systematic age errors. Although the best-fitting line does not necessarily have a value of r equal to the current growth rate, the latter is a useful guide. Experience with many data sets suggests that the line should go through the cluster of points at the early ages rather below the center, and that the values at ages in the 1950s and early 1960s are the most reliable indicators at the later years. Based on these principles, the alternative linear relations in the figure were derived. The lines have an r of 24 per 1,000. The central line provides a reasonable upper estimate for the male measures and lower estimate for the female measures; the upper and lower lines define the other boundaries for females and males, respectively. The conclusion is that f lies from 1.6 to 1.8 for males and from 1.8 to 2.1 for females. Table 9 gives the b_x and d_x measures calculated from the observations. The partial death rates adjusted by the estimated f corrections are shown in Table 12.

Directly-recorded deaths during the mid-1970s were also obtained in the SVRP. The data were collected over three years in ten sample areas by the Central Bureau of Statistics. The dual recording system was used to obtain estimates of underreporting. For each area, the deaths by age group from the survey component of the system were corrected by the estimated

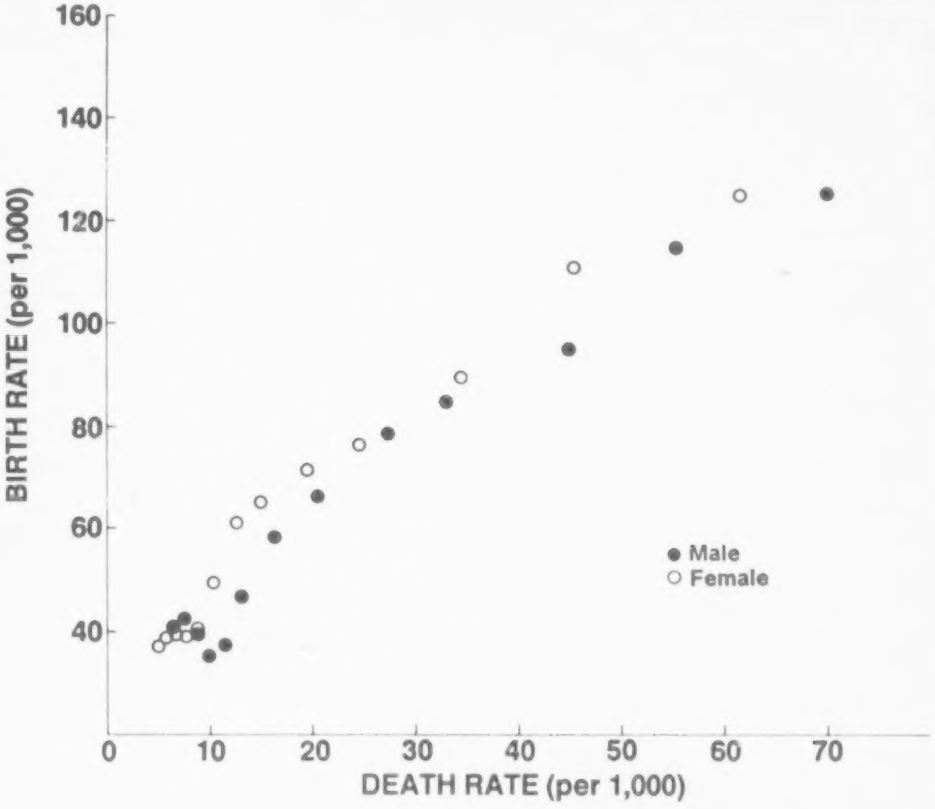

Figure 5. Growth-Balance Estimates, SUPAS II Death Rates: Indonesia

underreporting adjustment over all ages. The corrected deaths were related to the person-years of exposure over the three years to give the age-specific mortality rates by sex and age. Summation over the areas gave combined measures. Although these rates cannot be claimed as representative of the whole country, they may plausibly be roughly appropriate, in particular in pattern, if not in level. The growth-balance procedure has therefore been applied to the combination of the SVRP-specific death rates and the 1976 SUPAS II age distribution.

Figure 6 demonstrates that both the pattern and the level of mortality from the SVRP are consistent with the 1976 partial birth rates, b_x. The points are more regular than those for the SUPAS II household deaths, although some curvature from ages 35 to 50 is still present. However, the values beyond 50 are satisfactorily linear. There are no grounds for contrasting the accuracy of recording for males and females. A line with an r of 24 per 1,000 and a slope of 1 (which accepts the death rates as correct) is a fair represen-

Table 9. Partial Birth and Death Rates from SUPAS II: Indonesia

	Males				Females			
Age	Population over[a] (1,000s)	Deaths over[a] (100s)	Birth rate (per 1,000)	Death rate (per 1,000)	Population over[a] (1,000s)	Deaths over[a] (100s)	Birth rate (per 1,000)	Death rate (per 1,000)
5	51,224	2,960	—	5.8	52,886	2,495	—	4.7
10	41,973	2,649	41.1	6.3	43,983	2,186	37.1	5.0
15	33,969	2,553	42.4	7.5	36,581	2,138	38.5	5.8
20	27,571	2,436	39.3	8.8	29,885	2,036	39.5	6.8
25	23,135	2,275	35.6	9.8	24,793	1,888	38.7	7.6
30	19,333	2,178	37.5	11.3	20,290	1,775	41.8	8.8
35	15,882	2,050	46.3	12.9	16,316	1,661	49.8	10.2
40	11,979	1,925	58.6	16.1	12,164	1,534	60.8	12.6
45	8,865	1,821	66.2	20.5	8,922	1,341	65.3	15.0
50	6,106	1,672	78.5	27.4	6,336	1,228	71.9	19.4
55	4,075	1,347	84.5	33.0	4,368	1,073	76.1	24.6
60	2,661	1,191	95.4	44.8	2,911	999	89.2	34.3
65	1,536	849	114.1	55.3	1,772	803	111.1	45.3
70	908	635	124.4	70.0	1,043	643	124.8	61.6

[a] The terms "population over" and "deaths over" refer to the number of persons or deaths over the age indicated. For example, row 1 for males shows that the population over age 5 was 51,224,000, and that there were 2,960,000 deaths to persons aged 5 and over.

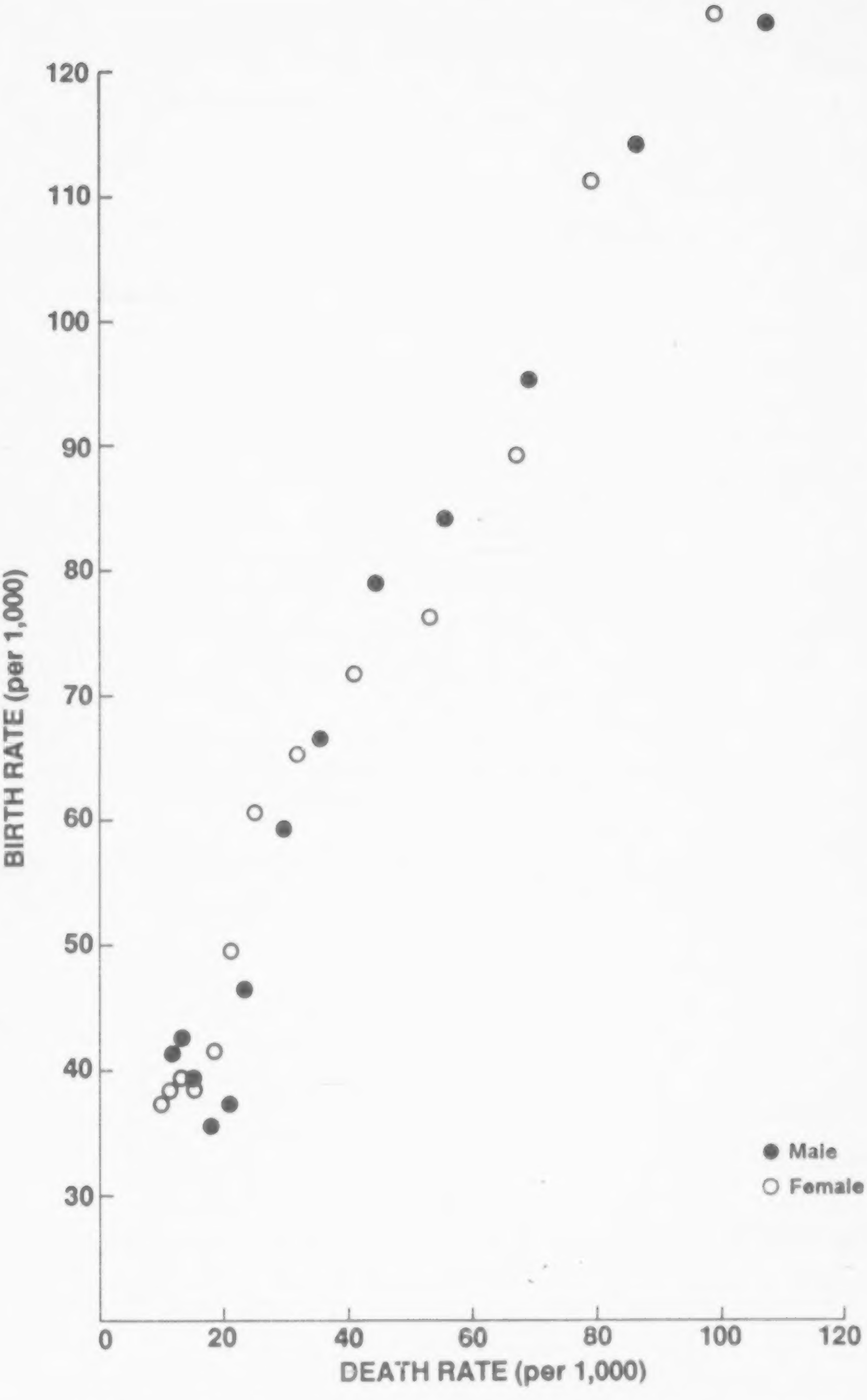

Figure 6. Growth-Balance Estimates from SVRP Death Rates: Indonesia

tation of the relation between b_x and d_x. However, this still leaves most of the points after the early ages on the upper side of the line. A line with a higher slope of 1.08 has been chosen as the best description. The partial birth and death rate measures are given in Table 10 and the adjusted values of the death rates in Table 12.

The 1971–80 Intercensal Period. A wide range of techniques can be used to estimate mortality from the survivorship of persons alive in 1971 to 1980. The simple procedure applied here is chosen for ease of comparison with the procedures adopted above. Separately for males and females, rates for persons aged 5½, 10½, 15½, etc., years and over were derived from the 1971 census single-year age distributions. Similarly for 1980, the rates for persons over ages 14½, 19½, 24½, etc., years were found. Subtraction of the numbers over 14½ years in 1980 from those over 5½ years in 1971, and so on, gave deaths in the nine-year interval. The corresponding populations at risk were taken as the averages of those over 5½ years in 1971 and 14½ years in 1980, and similarly at higher ages. Division of the deaths per year by the average populations then gives, approximately, partial death rates at over 10 years, over 15 years, and so on, for the intercensal interval, with results as shown in Table 11.

Comparison with Table 12 reveals huge discrepancies between the intercensal patterns of mortality by age and those calculated from the deaths. At the lower ages, the partial death rates are fairly similar, but at later ages, the intercensal measures are only about half of the others. Explanations based on changing census coverage or migration are not sensible here since the magnitudes required to achieve coherence are impossibly large. The discrepancy can be reduced a little by local smoothing of the age distribution to correct for digit preference, but not enough to be significant. It has been demonstrated (Brass and Swamy, 1980) that biases of the type found probably arise from an age error pattern in which overstatement increases with age. However, there was also a suspiciously large increase in the proportions at late ages in Indonesia between 1971 and 1980. It is likely, then, that the extreme distortion here came from the specific nature of the changing age errors. Whatever the reason, it is clear that the apparent intercensal patterns must be discounted; in fact, they suggest far lower old-age mortality than any of the Coale–Demeny regional models.

Evidence on the level and pattern of adult mortality is summarized in the form of partial death rates in Table 12. The concordance between the SUPAS II and SVRP estimates is encouraging in view of the data limitations. Up to middle adult ages, the SVRP unadjusted rates are rather close to the SUPAS II rates with the higher correction; thereafter (from about age 50 for males and 60 for females) the SVRP rates fall below the SUPAS rates. As noted above, although the pattern of the intercensal estimates is

Table 10. Partial Death Rates with SVRP Age-Specific Rates and SUPAS II Population Age Distribution: Indonesia

Age group	Males			Females		
	Age-specific rate (per 1,000)	Deaths over lower age (100s)	Death rate (per 1,000)	Age-specific rate (per 1,000)	Deaths over lower age (100s)	Death rate (per 1,000)
5–9	4.68	5,047	9.9	4.92	4,832	9.1
10–14	2.35	4,614	11.0	2.08	4,394	10.0
15–19	3.02	4,426	13.0	2.56	4,240	11.6
20–24	3.47	4,232	15.4	3.62	4,068	13.6
25–29	4.79	4,079	17.6	4.34	3,884	15.7
30–34	5.30	3,896	20.2	6.32	3,689	18.2
35–39	6.96	3,713	23.4	6.81	3,438	21.1
40–44	11.96	3,442	28.7	9.30	3,155	25.9
45–49	13.82	3,069	34.6	8.66	2,853	32.0
50–54	22.64	2,688	44.0	16.69	2,629	41.5
55–59	28.79	2,228	54.7	25.30	2,301	52.7
60–64	44.61	1,821	68.4	43.89	1,958	67.2
65–69	55.49	1,319	85.9	51.72	1,414	79.8
70–74	89.11	971	106.9	80.47	1,037	99.4
75+	128.85	524	128.9	122.45	576	122.4

Note: Partial birth rates are as in Table 9.

Table 11. Partial Death Rates Calculated from Survivorship from 1971 to the 1980 Census: Indonesia

	Males			Females		
Age	Average population (1,000s)	Deaths in intervals (100s)	Death rate (per 1,000)	Average population (1,000s)	Deaths in intervals (100s)	Death rate (per 1,000)
10	45,296	4,866	11.9	47,538	4,092	9.6
15	36,620	3,287	10.0	39,106	2,934	8.3
20	30,039	2,180	8.1	32,160	3,291	11.4
25	24,408	2,255	10.3	26,239	3,169	13.4
30	20,543	2,693	14.6	21,814	2,792	14.2
35	16,436	2,664	18.0	17,125	2,161	14.0
40	12,697	2,613	22.9	13,153	1,879	15.9
45	9,294	1,792	21.4	9,609	1,160	13.4
50	6,505	1,636	27.9	6,844	1,184	19.2
55	4,467	1,073	26.7	4,857	724	16.6
60	2,843	1,029	40.2	3,166	828	29.1
65	1,822	709	43.2	2,077	546	29.2
70	1,015	528	57.8	1,121	441	43.7

Table 12. Partial Death Rates Estimated by Different Methods, Mid-1970s: Indonesia

	Males					Females				
	SUPAS II, sample area mortality		SVRP, sample area mortality			SUPAS II, sample area mortality		SVRP, sample area mortality		
Age	Low	High	Low	High	Inter-censal	Low	High	Low	High	Inter-censal
5	9.2	10.4	9.9	10.6	—	8.5	9.9	9.2	9.9	—
10	10.1	11.4	11.0	11.9	11.9	8.9	10.4	10.0	10.8	9.6
15	12.0	13.5	13.0	14.1	10.0	10.5	12.3	11.6	12.5	8.3
20	14.1	15.9	18.4	16.6	8.1	12.3	14.3	13.6	14.7	11.4
25	15.7	17.7	17.6	19.0	10.3	13.7	16.0	15.7	16.9	13.4
30	18.0	20.3	20.2	21.8	14.6	15.8	18.4	18.2	19.6	14.2
35	20.7	23.2	23.4	25.3	18.0	18.3	21.4	21.1	22.8	14.0
40	25.7	28.9	28.7	31.0	22.9	22.7	26.5	25.9	28.0	15.9
45	32.9	37.0	34.6	37.4	21.4	27.1	31.6	32.0	34.5	13.4
50	43.8	49.3	44.0	47.5	27.9	34.9	40.7	41.5	44.8	19.2
55	52.9	59.5	54.7	59.1	26.7	44.2	51.6	52.7	56.9	16.6
60	71.6	80.6	68.4	73.9	40.2	61.8	72.1	67.3	72.6	29.1
65	88.5	99.5	85.9	92.5	43.3	81.6	95.2	79.8	86.2	29.2
70	111.9	125.9	106.9	115.5	57.8	110.9	129.4	99.4	107.4	43.7

unacceptable, the evidence on the overall level of mortality cannot be ignored. The difficulty here is that the measures at lower ages are also sensitive to age errors. For example, the male intercensal partial death rate goes down sharply from ages 10+ to 20+, an impossibility with reliable data. Examination of the age corrections discussed briefly in Chapter 2 suggests that for males and females together, the errors in numbers in the 5–9 and 10–14 age groups roughly cancel; thus survivorship from 5+ to 15+ will have a smaller bias than that for the next few age points. The partial death rate at over 10 years may then be the most reliable. The age errors indicate that the intercensal estimate for males will be too high and for females too low. Adjustments of this kind would bring the intercensal partial death rates for the 10+ age group into good agreement with the SVRP unadjusted measures. However, too heavy a reliance on the intercensal estimates is unwise since they could easily be distorted by changes in age errors between 1971 and 1980, as well as by quite small coverage differences. There is satisfactory evidence that the SVRP rates are fairly close to the truth. The growth-balance technique applied above gave a reasonably linear relationship between b_x and d_x, whose slope was estimated at around 1.08. On balance, it was decided to accept this result and, therefore, the correct SVRP rates, as representing Indonesian adult mortality in the mid-1970s.

Information for the estimation of adult mortality at earlier dates is scanty. Parental survival data from SUPAS II have been examined by McDonald (1978b). He concludes that the best estimates of mortality are likely to be provided by measures of the survival of mothers of eldest children, as opposed to the survival of mothers or fathers of all children, because the data for all children yield very low mortality levels (Table 13). McDonald's methodology assumes that the data refer to first-born children of the mother, but in many cases the data may refer to the eldest surviving child. In addition, his calculations assume that first births occurred over a short age range of mother, and that it is therefore possible to disregard the impact of the age structure of mothers. Hill et al. (1976) have developed a methodology for analyzing parental survival data for eldest children; this methodology takes account of the impact of the age distribution of mothers by assuming that distribution to be stable. The crucial respondents in the application of these methodologies to data from SUPAS II would have been born in the 1930s and 1940s, and their own age structure is rather flat. This indicates that the age distribution of their mothers may likewise have been somewhat flat; this may be due to the severe impact of the 1918 influenza epidemic in Indonesia, or to lower fertility in the 1940s than in the 1930s resulting from societal disruptions in the 1940s. In either case, the model assumptions behind the Hill et al. methodology would be challenged, although probably not seriously.

Table 13. Proportions of Mothers and Fathers Surviving, by Age of Respondent, 1976 Intercensal Survey: Indonesia

Age group	Mother still living	Father still living	Mother still living (eldest child)
0–4	.9926	.9799	.9924
5–9	.9763	.9449	.9812
10–14	.9597	.8974	.9650
15–19	.9251	.8316	.9373
20–24	.8768	.7558	.9043
25–29	.8032	.6285	.8309
30–34	.6802	.4899	.7251
35–39	.5725	.3580	.6319
40–44	.4401	.2469	.5077
45–49	.3468	.1732	.3987
50–54	.2120	.0933	.2689
55–59	.1358	.0641	.1830

Note: SUPAS II did not cover some areas of Indonesia that at the time of the 1971 census accounted for 3.24 percent of the total population.

The results obtained by applying the Hill et al. methodology show a pattern of mortality similar to that obtained by McDonald, although in general the overall level of mortality was higher in the McDonald estimates, particularly below aged 50. If the method is applied only to respondents aged 20–50, their mothers could have died over a 50-year period preceding the enumeration. Using the distribution of deaths by age in a stable population, McDonald has posited that his life table applies on average to about 12 years before the enumeration, that is, 1964; however, the range of time to which the data refer is very broad.

Brass and Bamgboye (1981) have developed formulae for establishing the time to which estimates of adult mortality from orphanhood refer on the assumption of regularity of trends. A later simplified version establishes the time of reference as follows:

$$T = \frac{N}{6}\left[3 - \frac{\dfrac{M}{S(1 - 80)}}{\dfrac{M}{(r - 80)} - \dfrac{N}{80}}\right],$$

where N is the mid-age of the responding age group, M the mean age at which the mothers or fathers bear the children, and S the proportion of mothers or fathers surviving. Values calculated from this expression are given in Table 14, which also shows a comparison of the orphanhood survivorship estimates with the corresponding measures from the favored, adjusted SVRP results.

The orphanhood and SVRP proportions of males surviving from age 32½ years are in very reasonable agreement at later ages (over 60 years). The discrepancies are greater for females, with the orphanhood-derived mortality lower (Table 15). However, the orphanhood measures are set back some 13 or 14 years before the SVRP measures at these ages. The female orphanhood estimates for earlier ages may be biased downward by the "adoption" effect (the tendency for foster mothers to be taken as the natural mother), but this has not commonly been the experience for fathers. It seems clear that deaths of parents are too low. Whether this was due to response errors or selection biases is impossible to specify. In any case, the data are inadequate for estimating trends in adult mortality.

The McDonald estimates from reports of survivorship of mothers of eldest children are more consistent with the higher mortality to be expected some 12 to 14 years before the 1976 survey. However, there have been serious practical difficulties with this method in interpreting "eldest," as indicated by the difference between the McDonald and Hill calculations. The evidence does not seem strong enough to justify any conclusions about the level of adult mortality in the mid-1960s. Although falls in childhood and adult mortality usually occur together, the relations between the two trends have been quite variable in different populations and periods.

Despite this assessment, the orphanhood results are roughly of the right orders. Regional differences in adult mortality levels based on the survivorship of mothers of eldest children are set out in Table 16 in terms of the expectation of life at age 20. As was the case with childhood mortality, the levels are low in Yogyakarta, East Java, and Bali, but high in Sulawesi and the eastern islands. Overall, however, the regional differences are not large.

Life Tables

Selected parameters from life tables based on parental survival data and the SVRP are shown in Table 17. In the SVRP tables, mortality after age 5 is based on the age-specific death rates already discussed, but with some graduation. The smoothing is light and local, however, and does not alter the general mortality level. In accordance with the discussion above, the SVRP pattern was accepted, but with the level of mortality raised by 8 percent in each age group for both males and females; the smoothing was retained. These schedules of mortality beyond age 5 were combined with the estimates of proportions of children dying at ages 1 year and 5 years already derived. Since these latter estimates were for the two sexes combined, it was necessary to incorporate a rather arbitrary differential between males

Table 14. Measures of Mortality Derived from Information on the Survival of Parents: Indonesia

	Survival of mother				Survival of father, all children
	All children		Eldest children		
	Brass-Hill method	Hill-Trussell method	McDonald (1978b)	Hill et al.[a]	Brass-Hill method
n	l_n/l_{25}	$l_n{}^a$	l_n/l_{20}	l_n/l_{25}	$l_n/l_{32.5}$
35	.9701	—	.9490	.9715	—
40	.9501	—	.9197	.9470	—
45	.9163	.6855	.8733	.9138	.9152
50	.8685	.6544	.7895	.8473	.8586
55	.7941	.6017	.6886	.7429	.7848
60	.6749	.5058	.5856	.6468	.6676
65	.5606	.4248	.4674	.5272	.5079
70	.4252	.3184	.3521	.4227	.3474
75	.3000	.2432	.2380	.3045	.2009
80	.1670	—		.2157	.1229

a. Kenneth Hill, private communication. Note that these estimates also take a value of M_1, the mean age of mothers at the time of their first birth, to be about one year younger than that used in the McDonald estimates. The difference is due to the fact that the McDonald estimate of M_1 assumes a flat age distribution while the Hill estimate assumes a stable age distribution. This partially accounts for the lower mortality in the Hill estimates.

b. Assumes $l_2 = 0.833$.

Table 15. Measures of Adult Survivorship from 1970s Life Table Compared with Orphanhood Estimates at True Locations: Indonesia

	$l_x/l_{32.5}$			l_x/l_{25}		
Age (x)	T	Orphanhood (males)	1970s life table	T	Orphanhood (females)	1970s life table
45	4.9	.9152	.8902	8.2	.9163	.8660
50	7.0	.8586	.8210	9.8	.8685	.8157
55	9.1	.7848	.7329	11.4	.7941	.7486
60	11.0	.6676	.6206	13.0	.6749	.6489
65	13.2	.5079	.4922	14.2	.5606	.5263
70	14.5	.3474	.3537	14.3	.4252	.3869
75		.2009	.2203		.3000	.2502
80		.1229	.1110		.1670	.1344

Table 16. Estimates of the Expectation of Life at Age 20 for Females, by Region, Based on Orphanhood Data (Eldest Child) from SUPAS II: Indonesia

	Expectations of life at age 20, females[a]		
Region	Total	Urban	Rural
Indonesia	42.5	44.4	42.0
Java	42.8	44.9	42.3
Jakarta	44.0	44.0	—
West Java	42.6	45.3	42.3
Central Java	41.4	45.5[b]	40.9
Yogyakarta	48.4	49.1[b]	48.1
East Java	43.6	45.3	43.4
Outside Java	41.7	43.4	41.4
Sumatra	41.5	43.5	41.1
Kalimantan	42.0	41.3	41.5
Sulawesi	40.6	41.8	40.5
Bali	42.9	47.5[b]	42.4
Other islands	39.7	41.0	39.6

a. For an explanation of the method of derivation, see McDonald (1978b). Note that the calculation assumes somewhat arbitrarily that the expectation of life at age 75 is 6.5 years in all areas.

b. These estimates may be unreliable because the data showed a higher proportion of mothers surviving to respondents in a given age group than to respondents in the preceding age group. This occurred for one age group in the cases of urban Central Java and Yogyakarta and for two age groups in the case of urban Bali, presumably, at least in the latter two areas, because of the small size of the sample. When it is considered that for all regions and for all age groups, there were more than four hundred such comparisons between successive age groups, the fact that only four were in the unexpected direction is very encouraging.

Table 17. Selected Parameters from Life Tables Constructed for This Report: Indonesia

Age	A	B	C	D	E
Survivors at exact age x, l_x					
0	1.000	1.000	1.000	1.000	1.000
1	.841	.860	.879	.885	.905
5	.757	.791	.816	.828	.852
10	.742	.773	.797	.807	.830
15	.734	.764	.788	.796	.820
20	.723	.753	.778	.784	.808
25	.711	.739	.764	.769	.793
30	.697	.723	.747	.751	.774
35	.680	.703	.725	.728	.749
40	.660	.675	.699	.697	.720
45	.632	.640	.669	.658	.687
50	.571	.594	.633	.607	.647
55	.498	.534	.585	.542	.594
60	.423	.458	.512	.459	.515
65	.338	.370	.422	.364	.417
70	.252	.272	.317	.262	.307
75	.160	.176	.212	.163	.199
Life table population ${}_nL_x$					
0	.90	.91	.92	.92	.94
1	3.14	3.26	2.35	3.39	3.48
5	3.75	3.91	4.03	4.09	4.20
10	3.69	3.84	3.96	1.01	4.12
15	3.64	3.79	3.92	3.95	4.07
20	3.59	3.73	3.86	3.88	4.00
25	3.52	3.66	3.78	3.80	3.92
30	3.44	3.56	3.68	3.70	3.81
35	3.35	3.44	3.56	3.56	3.67
40	3.23	3.29	3.42	3.39	3.52
45	3.01	3.08	3.25	3.16	3.34
50	2.67	2.82	3.04	2.87	3.10
55	2.30	2.48	2.74	2.50	2.77
60	1.90	2.07	2.33	2.06	2.33
65	1.48	1.61	1.85	1.56	1.81
70	1.03	1.12	1.32	1.06	1.26
75+	.91	1.08	1.36	.96	1.19

Table 17 (*continued*)

Age	A	B	C	D	E
Expectation of life at age *x*, e_x^0					
0	45.6	47.7	50[illegible]	48.9	51.6
1	53.1	54.3	56.3	54.2	56.0
5	54.8	54.9	56.5	53.8	55.4
10	50.9	51.2	52.8	50.1	51.8
15	46.5	46.8	48.4	45.8	47.3
20	42.1	42.4	44.0	41.5	43.0
25	37.8	38.2	39.7	37.2	38.8
30	33.5	34.0	35.6	33.1	34.7
35	29.2	29.9	31.6	29.0	30.8
40	25.1	26.0	27.7	25.2	26.9
45	21.1	22.3	23.8	21.6	23.1
50	18.0	18.8	20.0	18.2	19.3
55	15.3	15.6	16.4	15.0	15.8
60	12.6	12.8	13.4	12.3	12.9
65	10.1	10.3	10.8	9.8	10.3
70	7.7	8.1	8.5	7.7	8.1
75	5.7	6.1	6.4	5.9	6.2

Notes:

A: A life table for Indonesian females around 1964, constructed from data on the survival of mothers of eldest children (McDonald, 1978b:21).

B: The SVRP life table for males, 1974–77, SVRP areas (Gardiner, 1978).

C: The SVRP life table for females, 1974–77, SVRP areas (Gardiner, 1978).

D: Estimated Indonesian life table for males at mid-1970s (this report).

E: Estimated Indonesian life table for females at mid-1970s (this report).

and females based on the Coale–Demeny West Region model life tables. The life tables thus constructed for males and females are shown at D and E in Table 17.

The overall mortality level of the new tables is close to that found directly in the SVRP survey; however, the childhood rates are lower and the adult rates higher in the former. It may seem surprising that the adjustments are in opposite directions at these two stages of life. One possible reason for the inconsistency lies in the use of the same correction factor at all ages (found from the matching of the dual records). In some other studies, reports of deaths have been found to be more complete at child than at adult ages. Given the selective nature of the SVRP samples, however, it would be foolish to put much weight on the comparison.

The constructed tables retain the feature, present in the SVRP and indeed the SUPAS II death reports, of comparatively low mortality in the middle adult years, as compared with childhood and late ages. There seems no justification for smoothing out this characteristic by applying a single- or two-parameter model system. It would in fact be possible to graduate the life tables further by more elaborate procedures, for example, by use of the Zaba (1979) or Stoto (1981) alternative extensions of the logit model life table system to four parameters; however, such refinement does not seem justified for present purposes.

4 NUPTIALITY

This chapter describes changes in marriage patterns in Indonesia on a statistical level. No attempt is made to explain the reasons for those changes or to examine differences in marriage patterns among socioeconomic groups.

Before the 1970s, knowledge of marriage patterns in Indonesia was confined to a few isolated anthropological or demographic field studies (e.g., Gille and Pardoko, 1966; Singarimbun and Manning, 1974). There were only two sources of data that could be described as representative of broad areas: tables of age by marital status for three provinces of Java from the 1961 census, and for regions of Indonesia from the various rounds of the National Socioeconomic Survey (SUSENAS), held during the 1960s. These tables were analyzed by McNicoll and Mamas (1973). In their analyses, age at marriage, as indicated by proportions single in younger age groups or by the singulate mean age at marriage, was found to be lower for women in Java than for those in areas outside Java, the difference in means being about two years. Based on a comparison of proportions never married by age from earlier and later rounds of SUSENAS, McNicoll and Mamas tentatively suggested that there was an upward trend in age at first marriage in Indonesia during the 1960s.

During the 1970s, information on the marital status of the Indonesian population was obtained on an almost nationwide basis in the 1971 census, the 1973 Fertility-Mortality (FM) Survey, and the three rounds of SUPAS. In addition, complete marital histories were obtained for female respondents aged 15-49 in the FM Survey and in SUPAS III. Questions on age at first marriage and the number of times married were asked in SUPAS II. This rapid change in the data situation has prompted studies of Indonesian nuptiality. Two major monographs have been published, both based primarily on the marital history information collected in the FM Survey (Muliakusuma, 1976; Al Hadar, 1977).[1] These monographs present detailed information on age at first marriage and the extent of polygamy, divorce, widowhood, and remarriage for the various regions of Indonesia, as well as for major socioeconomic groups. The FM Survey remains the major source of information on marriage patterns because of its large sample size and geographic spread as compared with SUPAS III, and the detail of its questions as compared with SUPAS II. However, the SUPAS data provide an excellent opportunity for comparisons with similar indices obtained from the 1971 census and the FM Survey, so that one can evaluate the relative accuracy of the data being analyzed.

---

[1] A third major, unpublished study based on the FM Survey data, the Ph.D. thesis (University of Chicago) of Budi Suradji, was not available at the time of writing.

Methodology

In general, the monographs of Muliakusuma and Al Hadar make use of cohort rather than cross-sectional analysis. In other words, age at marriage is analyzed for birth cohorts, marital disruption is analyzed for marriage cohorts, and remarriage is analyzed according to the time of termination of the previous marriage. Since it has been pointed out that cross-sectional measures of nuptiality during periods of changing marriage patterns can be severely distorted and therefore misleading (McDonald, 1974), some confidence can be placed in their analyses.

Given data on age of the population by sex and marital status from a single enumeration, it is possible to construct an index of age at marriage called the singulate mean age at marriage (Hajnal, 1953). It should be noted, however, that the calculation of this measure involves an assumption that nuptiality patterns in the past have been constant; more importantly, the measure is not at all robust to variations in the assumption of constancy. It is therefore by definition incorrect to calculate this measure at two enumerations, and to then interpret the observed difference as the change in age at marriage. The singulate mean age at marriage is equally a misleading index of the age at marriage at a particular time, if age at marriage is changing. In addition, because of the skewed nature of the distribution of ages at first marriage, the mean of the distribution is less informative as a measure of central tendency than is the median or, for that matter, the mode. The following analysis therefore emphasizes cohort methods and the quartiles of the distribution of ages at marriage, rather than the mean of the distribution.

Age at First Marriage

A simple indicator of age at marriage is given by the proportion who are not yet married in some early adult age group. In Indonesia, the best indicator for females is the proportion never married in age group 15–19, and for males that proportion in age group 20–24. These indicators are shown in Table 18 for regions of Indonesia based on the 1971 census, the FM Survey, SUPAS I, and SUPAS II. One would expect the values obtained from the two SUPAS studies to be almost the same, and the values from the FM Survey (1973) to fall between those for the 1971 census and SUPAS. In fact, however, the proportions never married for both men and women were almost always higher in SUPAS I than in SUPAS II, while the FM Survey proportions are high in relation to those of SUPAS and the census. The trend between the FM Survey and SUPAS II would indicate a substantial decline in age at marriage, which is most unlikely. The information given in Table 18 is therefore somewhat disconcerting. When only one source of

Table 18. Percentages Never Married, Females Aged 15-19 and Males Aged 20-24, by Region, 1971 Census, 1973 FM Survey, SUPAS I, and SUPAS II: Indonesia

	Females				Males		
Region	1971 census	FM Survey	SUPAS I, 1976	SUPAS II, 1976	1971 census	SUPAS I, 1976	SUPAS II, 1976
Indonesia	62.1	—	67.6	64.4	58.2	57.9	55.2
Java	56.3	—	62.6	59.2	56.2	55.9	53.7
Jakarta	68.5	—	72.5	73.7	70.7	69.0	72.1
West Java	47.0	55.3	51.3	44.8	42.9	44.3	42.0
Central Java	60.1	75.0	67.3	65.4	57.0	56.8	52.0
Yogyakarta	85.4		82.9	86.0	78.1	69.5	71.6
East Java	55.0	62.8	63.3	59.6	60.3	59.6	58.1
Outside Java[a]	72.2	—	76.7	73.8	61.6	61.7	58.1
Sumatra	69.8	76.9	76.1	71.6	62.3	62.0	56.5
Kalimantan	71.1	—	70.7	67.8	63.2	61.1	58.2
Sulawesi	76.1	82.8	79.8	79.9	60.1	60.7	59.6
Bali	80.5	88.0	82.3	80.6	59.2	60.2	61.1
Other islands[a]	73.6	—	83.4	82.0	59.1	63.4	64.4

---

a. The areas of "other islands" not included in SUPAS I and II have been excluded from the 1971 census data so that the comparison is precise.

data is available and its results look reasonable, it is accepted; when four sources of data are available, their consistency must be considered.

The differences among data sources could relate to differing patterns of age misstatement in relation to marital status, or to relative under- or overenumeration of certain marital statuses. Of course, some degree of random fluctuation might also be expected, but given the large size of all four enumerations, this source of error should be minimal. Although numerous hypotheses might be advanced to explain the observed, unexpected differences among proportions never married, it would be difficult to prove any of these hypotheses without having followed the interviewers in all four enumerations. It seems, though with little supporting evidence, that the two larger enumerations, the 1971 census and SUPAS I, may provide the best indication of the levels and trends in age at marriage. From this comparison, it would be concluded that age at first marriage rose slightly between 1971 and 1976 for females and remained constant for males.

The differences among regions are consistent across the various enumerations and tend also to confirm the observations made on the basis of data from the 1960s. Age at marriage for females is generally higher outside than within Java. In Java, the earliest age at marriage occurs in West Java, followed by East and Central Java, and with a much later age at marriage in Yogyakarta. The age at marriage in Jakarta was much lower than that in Yogyakarta, but also lower than that in the regions outside Java. Outside Java, age at marriage was highest in Bali, followed by Sulawesi. The regional differences for males show some variation from those for females. With the exception of the very early age at marriage for males in West Java and the late age in Yogyakarta, there were very few differences among regions in the age at marriage of males. This means that age differences between husbands and wives must be substantially lower in Bali than in East Java. It may also be noted that the high proportion of males never married in age group 20–24 in Jakarta may reflect migration patterns.

Given the problems involved with tables of marital status and age, it is possible that analysis of responses to direct questions on age at marriage may provide more reliable information on the levels and trends in age at marriage. Such information is available for females from three major sources: the marital histories in the FM Survey and SUPAS III, and a direct question on age at first marriage asked in SUPAS II. These data are best analyzed in cohort form in terms of the characteristics of the distribution of ages at first marriage. Table 19 therefore shows the age by which 25 percent, 50 percent, and 75 percent of persons in a given age group (birth cohort) had married in the three studies from which the data are available. Because little variation was observed in the quartile ages at marriage for

Table 19. Ages at Which Percentages of Various Birth Cohorts of Women Had Married, FM Survey, SUPAS II, and SUPAS III: Java and Bali

Region and age at survey	Quartile (percentage)	FM Survey	SUPAS II	SUPAS III
West Java				
20–24	25	15.2	15.4	14.5
	50	16.9	17.2	16.3
	75	18.7	20.0	19.1
25–29	25	14.8	14.9	13.5
	50	16.4	16.3	15.8
	75	18.5	18.3	18.5
30–49	25	14.2	14.8	13.0
	50	16.0	16.0	15.2
	75	17.9	17.8	17.0
Central Java[a]				
20–24[b]	25	16.3	16.1	15.7
	50	18.2	18.0	17.8
	75	20+	20+	20+
25–29	25	15.6	15.5	14.8
	50	17.4	17.4	16.6
	75	19.6	19.6	19.1
30–49	25	15.3	15.2	13.5
	50	17.0	16.8	15.8
	75	19.4	18.7	18.4
East Java				
20–24[b]	25	15.3	15.8	14.7
	50	17.1	17.9	16.9
	75	19.2	20+	20.0
25–29	25	14.8	15.3	13.4
	50	16.7	16.9	15.8
	75	19.2	19.2	18.6
30–49	25	14.3	15.0	13.4
	50	16.3	16.5	15.6
	75	18.8	18.6	18.1
Bali				
20–24[b]	25	18.3	18.3	16.9
	50	20+	20+	19.5
	75	20+	20+	20+
25–29	25	17.4	18.5	16.8
	50	19.5	20.4	19.5
	75	23.1	23.3	22.8
30–49	25	17.5	18.8	16.7
	50	19.5	20.7	19.6
	75	22.6	24.2	23.1

a. Includes Yogyakarta.

b. Age 20+ indicates that the quartile age overlaps with the current age, and thus the results may be misleading.

the age groups 30-34, 35-49, 40-44, and 45-49, these were combined into a single category to facilitate the analysis.

Since the FM Survey predated SUPAS by three years, the quartiles shown for age group 20-24 in the FM Survey correspond to a group about halfway between those aged 20-24 and 25-29 in SUPAS. With some exceptions, Table 19 shows a fairly high level of consistency between the FM Survey and SUPAS II, but the estimates of age at marriage from SUPAS III are generally somewhat lower, particularly at the first quartile. In fact, the levels for SUPAS III seem unreasonably low, with 25 percent of women in West and East Java marrying before or around their thirteenth birthday. All three sources of data indicate very slight rises in age at marriage from the cohort aged 30-49 to that aged 25-29, with a steeper rise occurring between those aged 25-29 and 20-24 for the three regions of Java. Little change in age at marriage is evident for Bali; the level of age at marriage in Bali is substantially greater than the levels in the three provinces of Java.

Given the relative consistency of direct data on age at marriage from SUPAS II and the FM Survey, the broader regional comparisons made in Table 20 are based on SUPAS II because of its wider geographic coverage. Regarding differences in levels among regions, Table 20 confirms that age at marriage for women is highest in Bali and Yogyakarta, with the median age in both provinces exceeding 20 for rural women aged 20-24 in 1976. The high age at marriage in Yogyakarta is shown to be the result of a strong upward trend over time; in the case of Bali, the median age at marriage has been high for a long time and may even have decreased slightly in recent years. The areas of eastern Indonesia—Sulawesi and "other islands"—had the next highest ages at marriage, while the lowest ages prevailed in the three large provinces of Java, with the earliest occurring in West Java.

In urban areas, a strong upward trend in marriage age is evident throughout Indonesia; the median age at first marriage now exceeds 20 in all urban areas, with the interesting exception of Jakarta. In rural areas, there appears to have been little increase in age at marriage among women between ages 25 and 50 in 1976, with the major exception of rural Yogyakarta, and to a lesser extent Central and East Java. However, data for rural women aged 20-24 in 1976 indicate a clear movement to a higher age at marriage, with the strongest rises occurring in Yogyakarta, East Java, and Sulawesi. The cohort aged 20-24 in 1976 would have been marrying primarily in the latter 1960s and early 1970s. Finally, the urban-rural difference in age at marriage is much wider within than outside Java; in fact, for women aged 30-49 living outside Java, there was very little difference in age at marriage between rural and urban areas.

In conclusion, it used to be that 50 percent of Indonesian women married before their seventeenth birthday. For women aged 20-24 in 1976, this

Table 20. Ages at Which 50 Percent of Each Age Group Had Married, Urban and Rural Females, by Region, SUPAS II: Indonesia

Region	Age group[a]	Total	Urban	Rural
Indonesia	20–24	18.3	20.5+	17.9
	25–29	17.4	19.4	17.1
	30–49	17.0	18.1	16.8
Java	20–24	17.8	20.4	17.3
	25–29	16.9	19.3	16.6
	30–49	16.5	17.8	16.3
Jakarta	20–24	19.6	19.6	—
	25–29	19.4	19.4	—
	30–49	17.7	17.7	—
West Java	20–24	17.2	20.1	16.9
	25–29	16.3	18.7	16.1
	30–49	16.0	17.3	16.0
Central Java	20–24	17.7	20.5+	17.3
	25–29	17.1	19.8	16.9
	30–49	16.6	18.3	16.4
Yogyakarta	20–24	20.5+	b	20.5+
	25–29	20.2	b	20.0
	30–49	18.9	b	18.7
East Java	20–24	17.9	20.5+	17.9
	25–29	16.9	19.0	16.9
	30–49	16.5	17.8	16.4
Outside Java	20–24	19.3	20.5+	18.9
	25–29	18.5	19.5	18.3
	30–49	18.4	18.5	18.4
Sumatra	20–24	18.8	20.4	18.5
	25–29	18.1	18.9	17.9
	30–49	18.1	18.2	18.0
Kalimantan	20–24	18.7	20.5+	18.3
	25–29	18.5	19.9	18.0
	30–49	18.1	18.7	17.9
Sulawesi	20–24	20.4	20.5+	20.1
	25–29	19.0	19.7	18.8
	30–49	18.5	18.5	18.5
Bali	20–24	20.3	b	20.0
	25–29	20.4	b	20.3
	30–49	20.7	b	20.7

Table 20 (*continued*)

Region	Age group[a]	Total	Urban	Rural
Other islands	20–24	20.0	b	19.6
	25–29	19.3	b	19.1
	30–49	19.3	b	19.2

a. For age group 20–24, the median frequently falls within the age group. This means that the ultimate median for this age group may still be affected by the future marriages of women aged 20–24. In these instances, the result has been written as 20.5+, except where the median is only a little greater than 20.

b. Unreliable because of small sample size.

age had risen to 18.3 years. Therefore, age at first marriage is increasing, but quite slowly.

Marital Disruption and Remarriage

The proportions reported as currently widowed or divorced are the net effect of marital disruption and remarriage. The utility of such data in measuring the extent of marital disruption or remarriage is therefore limited. However, comparison of these data from different data sources can be used to evaluate the accuracy of the sources. For example, on the basis of a comparison with data from the 1971 census, it has been concluded that the FM Survey heavily underenumerated widowed and divorced women (McDonald et al., 1976). An examination of the proportions widowed and divorced by age groups from SUPAS I and II indicates that the two sources are relatively consistent with each other and also with the 1971 census data.

Another measure that gives an idea of the extent of marital disruption and remarriage combined is the percentage of persons in a given age group who had married more than once. This index is shown for women aged 40–49 in the FM Survey and SUPAS II in Table 21 for the various regions of Indonesia. The comparison in this table is disconcerting. A striking example is the regional comparison between East Java and Sumatra: Data from the two sources are relatively consistent for Sulawesi and Bali and for urban areas in Java, but SUPAS yields much higher proportions married more than once in rural areas of Java and a much lower proportion in rural Sumatra. There are no explanations for these differences other than sampling variability or inaccuracy in one or both sources. Given that the FM Survey heavily underenumerated currently widowed and divorced females aged 40–49, and positing that currently widowed and divorced persons tend to include a relative preponderance of once-married persons, the percentages married more than once from the FM Survey would tend to be biased on the high side. This deficiency thus does not explain the differences be-

Table 21. Percentages of Ever-Married Urban and Rural Women Aged 40–49 Who Had Married More Than Once, by Region: Indonesia

Region	Source	Total	Urban	Rural
Indonesia	SUPAS II	37.0	28.5	38.7
Java	SUPAS II	44.0	31.6	46.5
Jakarta	SUPAS II	30.2	30.2	—
West Java	FM Survey	43.9	40.3	44.3
	SUPAS II	54.7	43.8	56.1
Central Java	FM Survey[a]	28.7	26.0	29.1
	SUPAS II	44.9	30.8	46.6
Yogyakarta	SUPAS II	33.6	26.9	35.0
East Java	FM Survey	31.4	27.2	32.1
	SUPAS II	38.3	26.5	40.1
Outside Java	SUPAS II	20.0	22.1	19.6
Sumatra	FM Survey	31.7	20.6	34.5
	SUPAS II	19.9	26.5	18.3
Kalimantan	SUPAS II	15.5	12.0	16.5
Sulawesi	FM Survey	20.2	18.0	20.7
	SUPAS II	20.8	20.5	20.9
Bali	FM Survey	13.0	—	—
	SUPAS II	15.4	14.0	15.5
Other islands	SUPAS II	29.6	7.4	32.2

a. Includes Yogyakarta.

tween SUPAS and the FM Survey in rural Java. The SUPAS II figure for rural Sumatra seems far too low given the percentage married more than once in urban areas. On the other hand, the urban–rural differences in Java appear to be rather low in the FM Survey data. Alden Speare (1978) warned that SUPAS II, because of the highly clustered nature of the sample, may give misleading estimates of interisland rural-to-rural migration. If the extent of divorce and remarriage varies widely from village to village within a region—and some evidence suggests that this may be the case—there may be a possibility that SUPAS–FM Survey differences are due to sampling errors. This is a matter that needs further investigation.

It can be concluded from Table 21, however, that between 35 and 45 percent of women aged 40–49 in Java had married more than once, while outside Java this proportion was much lower. Most of this remarriage would have occurred subsequent to divorce rather than widowhood. The lowest rates of multiple marriage occurred in Bali, and the highest in West Java.

Direct measures of the extent of divorce are available only from the marital history data obtained in the FM Survey and SUPAS III. A thorough analysis of levels and trends in divorce based on the FM Survey has been made by Muliakusuma (1976), whose summary table is reproduced here as Table 22. This table shows regional differences in divorce similar to those indicated by Table 21. Divorce is shown to be infrequent in Bali and Sulawesi and most frequent in West Java, where among women married in the 1940s, about 45 percent had divorced within 20 years of marriage. Given that a further 6 percent had been widowed in the same period (Muliakusuma, 1976), more than 50 percent of first marriages in West Java in the 1940s were terminated within 20 years; the comparable figure for Bali was only about 20 percent.

Table 22 also indicates that the divorce rate from the first marriages has been decreasing in all areas, a trend shown clearly in Muliakusuma's graphs. Most divorces occurred within five years of marriage in all regions; in fact, in most regions about 60 percent of divorces in the first 20 years took place in the first three years. However, Muliakusuma also shows that the divorce rate from marriages subsequent to the first was even higher than the rate from first marriages, and that the duration of the higher-order marriages ending in divorce was just as brief. Following divorce, about 50 percent of women remarried within two years and about 80 percent within five years. Widows were less likely to remarry, perhaps because they were older on average than divorcees, but even 40–50 percent of widows under age 45 had remarried within five years.

An analysis of marital history data from SUPAS III has not been possible for this study. However, as noted above, much of Muliakusuma's detailed analysis from the FM Survey data will not be possible from SUPAS III because of the relatively small size of the sample. SUPAS III, however, included the category "separation" as a means by which marriages could end, a category not so clearly defined in the FM Survey. Of all terminations of first marriages by divorce or separation recorded in SUPAS III, 8 percent were separations; however, many separated women would have been awaiting a legal divorce, particularly those who had been deserted.

Only one table based on SUPAS III is given here, showing the extent of marital disruption in the provinces of Java and Bali. Table 23 displays the percentage of women whose first marriages had ended in divorce or separation according to the number of years that had elapsed between the time of the marriage and the survey. This table does not add very much to the conclusions already drawn, except that it shows a higher proportion of marriages terminated under one year than is apparent in the FM Survey

Table 22. Cumulative Percentages of Rural and Urban Women Divorced from First Marriages, by Duration of Marriage and Region, Marriage Cohorts of 1940–49, 1950–59, and 1960–69, FM Survey, 1973: Indonesia

Duration of marriage in completed years	Year of marriage					
	1940–49		1950–59		1960–69	
	Urban	Rural	Urban	Rural	Urban	Rural
West Java						
1	7	13	4	10	3	8
3	28	28	16	23	10	20
5	36	34	20	28	a	a
10	41	39	22	33	a	a
20	46	43	a	a	a	a
Central Java						
1	3	6	5	6	2	5
3	14	19	12	17	9	13
5	17	23	16	21	a	a
10	20	26	21	25	a	a
20	25	29	a	a	a	a
East Java						
1	5	6	3	7	4	6
3	11	17	10	17	8	15
5	13	21	14	20	a	a
10	18	25	19	24	a	a
20	21	28	a	a	a	a
Bali						
1	—	1	—	2	—	2
3	—	4	—	6	—	5
5	—	7	—	7	—	a
10	—	10	—	9	—	a
20	—	11	—	a	—	a
Sumatra						
1	2	7	1	4	1	4
3	7	19	5	12	4	10
5	13	22	9	15	a	a
10	18	28	11	18	a	a
20	20	32	a	a	a	a
Sulawesi						
1	2	1	1	2	1	2
3	6	7	5	7	3	5
5	9	10	8	10	a	a
10	12	13	12	13	a	a
20	14	15	a	a	a	a

a. Biased because not all women in the given marriage cohort had completed the relevant marriage duration by the time of the survey.

Source: Muliakusuma (1976:table IV.2, p. 54).

Table 23. Percentages of First Marriages Ending in Divorce or Separation According to the Number of Years That Elapsed between the Marriage and the Survey Data, by Region, SUPAS III: Indonesia

Region	Years elapsed since first marriage				
	<1	1	2–4	5–9	10+
Java	13.5	16.9	23.5	26.9	38.5
Jakarta	6.1	12.2	14.3	18.5	30.7
West Java	14.3	15.7	27.2	34.5	44.8
Central Java	16.8	20.1	23.0	24.3	37.1
Yogyakarta[a]	10.0	10.7	10.9	16.6	29.1
East Java	11.9	17.0	22.9	23.8	36.7
Bali[a]	5.9	0	1.6	7.1	7.4

a. Based on small sample size.

data. This may reflect the inclusion of separations, which under one year of time elapsed since marriage accounted for about 50 percent of all terminations.

In summary, the level of divorce in Java is high but slowly declining, while the divorce rate outside Java is much lower. Divorce occurs rapidly after marriage, and remarriage usually follows divorce within a short period. However, the divorce rate from higher-order marriages is just as high, if not higher, than that from first marriages. For marriages taking place in the 1940s, only about 6 percent were terminated by the death of the husband in the first 20 years, and with mortality decline, this proportion is falling. Around 50 percent of widows (under age 45) remarried within five years.

Table 24, again taken directly from the study of Muliakusuma, indicates that the completed fertility of once-married women was about 15 percent higher than that of women who had been married more than once, the exception being rural Central Java. However, in another table, Muliakusuma shows that the low average fertility of women married more than once appears to have been related to the higher proportion of these women with parity zero, one, or two. In other words, low fertility may have been a contributing factor to divorce, rather than the reverse. If this is the case, then the divorce rate may not be having a very great effect on the average completed fertility of any region of Indonesia.

Conclusion

The comparison of various sources of data on nuptiality in Indonesia indicates many inconsistencies. In respect to tables of marital status cross-classified by age, it appears that the most accurate measures of level and

Table 24. Average Numbers of Children Ever Born to Women Who Had Married for the First Time 15 Years or More before the Survey, by Number of Marriages and Region, FM Survey, 1973: Indonesia

	Average number of children ever born		
Region (1)	Married once (2)	Married more than once (3)	Marriage-fertility ratio (4) = (2)/(3)
West Java			
Urban	6.15	4.83	1.27
Rural	5.73	4.89	1.17
Central Java			
Urban	5.17	4.08	1.27
Rural	4.48	4.77	0.94
East Java			
Urban	4.45	3.12	1.43
Rural	4.54	3.94	1.15
Bali, Total	5.92	5.25	1.13
Sumatra			
Urban	6.68	5.80	1.15
Rural	6.36	5.48	1.16
Sulawesi			
Urban	5.92	4.90	1.21
Rural	5.97	5.68	1.05

Source: Muliakusuma (1976:table V.5, p. 100).

change can be obtained from the 1971 census data in comparison with data from SUPAS I in 1976. The proportion of females currently married by age group for provinces of Java and Bali based on the 1971 census and SUPAS I is shown in Table 25. For 1976 the category "separated" in the SUPAS data has been combined with the category "married" used in the 1971 census.

It is conventional to examine the impact of changes in proportions married upon the total fertility rate by holding age-specific marital fertility rates constant while the proportions married are varied. If this exercise is carried out for the six provinces for which data are given in Table 25, changes in proportions married between 1971 and 1976 lead to the following changes in the total fertility rate:

Jakarta	-4%
West Java	No change
Central Java	-3%

Yogyakarta	+2%
East Java	-2%
Bali	-3%

Despite problems with the data, it is probable that the impact of changing marriage patterns on fertility was quite small in the period 1971-76. For the six provinces considered, the amount of fertility change attributable to nuptiality change appears to be negligible. The mechanics of the impact of changes in marriage patterns on fertility are more complicated than this simplistic analysis would imply. For example, with increased age at marriage, age-specific marital fertility rates at younger ages may increase; the distribution of married persons by duration of marriage would change, leading to translation effects. If the higher proportions married at older ages represent a lower likelihood of divorce among sterile or subfecund women, then the increased proportions married at these ages will not yield higher total fertility. Despite these methodological reservations, the conclusion that changes in marriage patterns during the first half of the 1970s have had very little impact on fertility is still likely to prevail. This conclusion agrees closely with the lack of emphasis on increased age at marriage in Indonesian population and social policy.

Table 25. Proportions of Women Currently Married (Including Separated), by Age Group, 1971 Census and SUPAS I: Indonesia

Age group	Year	Jakarta	West Java	Central Java	Yogyakarta	East Java	Bali
15-19	1971	.281	.444	.339	.131	.372	.182
	1976	.252	.419	.284	.153	.321	.169
20-24	1971	.667	.814	.748	.559	.739	.689
	1976	.602	.790	.718	.573	.704	.628
25-29	1971	.832	.889	.878	.847	.858	.841
	1976	.791	.888	.865	.826	.855	.835
30-34	1971	.854	.889	.870	.866	.862	.850
	1976	.871	.898	.879	.871	.869	.860
35-39	1971	.831	.851	.838	.866	.815	.855
	1976	.842	.872	.867	.846	.853	.861
40-44	1971	.737	.763	.764	.811	.709	.805
	1976	.780	.804	.788	.830	.760	.787
45-49	1971	.679	.694	.689	.742	.631	.760
	1976	.708	.732	.725	.784	.687	.771

5 FERTILITY

The main sources of fertility estimates in Indonesia are as follows:

- Retrospective data on children ever born by age of mother (1971 census; 1973 FM Survey; 1976 SUPAS I, II, III; and fragmentary materials from the 1961 census).
- The same retrospective data categorized by household, the basis for the so-called own children method of estimation (1971 census; 1976 SUPAS I, II).
- Data on last birth (SUPAS II).
- Recorded pregnancy histories (1973 FM Survey; SUPAS III).
- The 1980 census, which gives critical evidence on numbers of children by age and when processed will provide both retrospective and last-births data.

Problems involved in all of these data types dictate caution in deriving estimates, although they are by no means unique to the Indonesian case. The problems of concern include: understatement of children ever borne by older women; significant proportions of women (5–10 percent) for whom parity for some reason is not stated; differential undernumeration of population by age (most strikingly, of children below age 1 in the 1971 census); age misreporting, including the extreme age heaping found in the Indonesian single-year age distributions; and systematic timing errors that often enter pregnancy history data (see Potter, 1977).

Despite these problems, there are now enough independent data sources so that, using corrobating estimates from various sources and different estimation methods, it is possible to form a picture of Indonesian fertility that can be accepted with a reasonable assurance of accuracy. Unfortunately, the picture, as with mortality, covers only the 1960s and an incomplete part of the 1970s. Prior to this period, knowledge of Indonesian fertility is fragmentary and national estimates are quite speculative. Fertility changes in the late 1970s are likely to be known only when results of the 1980 census have been fully analyzed.

"Own-Children" Fertility Estimates

The Cho–Graybill "own-children" method of fertility estimation involves the backward projection of numbers of mothers and children within households to the time of each birth and aggregation over households. In addition, adjustments must be made to allow for household members' children living elsewhere and for other children living in the household, and imputation rules must be developed for cases where more than one mother resides in the household. The method also requires the preparation of special tabulations in which information about household residence is not obliterated (as happens in the conventional tabulations of children ever born by age of mother). Such tables were prepared for the 1971 census and SUPAS I and II.

Own-children estimates can be made by single calendar year for an interval of ten or more years prior to the enumeration. However, problems of underenumeration and errors in the basic age data (affecting both the numerator—estimates of births—and the denominator—women of childbearing age) argue against using such single-year estimates. The gross underenumeration of children aged less than 1 year in the 1971 census, and to a lesser degree in SUPAS I and II, means that any fertility estimate using that age group would need a major adjustment for undercount. To avoid this, we do not present estimates for the year preceding these enumerations. Age misstatement and differential underenumeration problems at higher ages are recognized by a grouping of the data into broader age groups—using ranges chosen to minimize age-heaping distortions. In the original report giving own-children fertility estimates from the 1971 census (Cho et al., 1976), average fertility rates were presented for the periods 1961-63, 1964-66, and 1967-70 (and for the whole decade, 1961-70); the SUPAS I and II data have been used to give fertility estimates for 1967-70 and 1971-75.

Obvious interest attaches to the estimates for 1967-70, since they show the extent of consistency of the 1971 census and SUPAS. The 1971 census estimates for this period are based on children aged 1-4, while the SUPAS estimates are based on children aged 6-9. (For SUPAS I, the mortality adjustment used the 1971 census child-mortality estimates, since SUPAS I, unlike SUPAS II, did not collect data on children ever born and surviving.)

Table 26 presents average fertility estimates for the period 1967-70 for Indonesia and its major administrative and geographic subdivisions based on the 1971 census and SUPAS I and II; shown in the righthand column are estimates for 1967-71 based only on the survey data on own children aged 5-9. For Indonesia as a whole, the estimated total fertility rates (TFRs) derived from the different sources are very close—5.52 based on the census, as compared with 5.66 and 5.46 for the SUPAS estimates. Considering that these estimates are based on three different enumerations and two different age segments, the agreement is striking. The different data sources are also highly consistent for the provincial and regional breakdowns within Indonesia: Among the provinces and regions identified, the largest divergence in TFR (some 7-8 percent) is found in East Java, Kalimantan, and Sulawesi. The TRFs shown for 1967-71 indicate the negligible difference in the estimates even when children aged 5 are included in the calculation. Typically, age data for Indonesia exhibit severe age misstatement and heap-

Table 26. Age-Specific Fertility Rates, 1967-70, and Total Fertility Rates, 1967-70 and 1967-71, by Region: Indonesia

Province/region and source	Age-specific fertility rates, 1967-70							TFRs	
	15-19	20-24	25-29	30-34	35-39	40-44	45-49	1967-70	1967-71
Jakarta									
Census	140	266	268	198	110	41	12	5.12	
SUPAS I	114	246	267	197	134	46	7	5.05	5.07
SUPAS II	97	234	245	199	126	57	20	4.88	4.87
West Java									
Census	208	305	280	211	119	50	14	5.86	
SUPAS I	180	284	278	210	141	63	26	5.90	5.94
SUPAS II	160	267	280	215	156	68	24	5.84	5.82
Central Java									
Census	144	284	265	199	115	47	12	5.27	
SUPAS I	145	272	272	208	134	53	17	5.51	5.46
SUPAS II	122	255	258	207	129	63	26	5.30	5.22
Yogyakarta									
Census	68	253	252	199	117	48	14	4.68	
SUPAS I	81	225	242	188	129	63	17	4.73	4.71
SUPAS II	60	224	248	200	148	62	24	4.83	4.78
East Java									
Census	149	246	225	169	96	45	14	4.65	
SUPAS I	139	239	232	169	114	47	22	4.81	4.83
SUPAS II	132	226	204	167	109	42	16	4.48	4.58
Total Java									
Census	163	275	254	191	109	47	13	5.20	
SUPAS I	149	260	258	193	129	54	20	5.32	5.33
SUPAS II	132	246	245	195	129	57	22	5.13	5.13

Table 26. *(continued)*

Province/region and source	Age-specific fertility rates, 1967–70							TFRs	
	15–19	20–24	25–29	30–34	35–39	40–44	45–49	1967–70	1967–71
Bali									
Census	134	298	300	229	137	67	26	5.82	
SUPAS I	107	265	286	220	157	84	37	5.78	5.75
SUPAS II	79	236	285	234	169	89	39	5.65	5.69
Sumatra[a]									
Census	154	324	324	260	157	69	20	6.44	
SUPAS I	159	312	328	258	170	84	31	6.70	6.68
SUPAS II	147	292	293	242	175	81	29	6.30	6.26
Kalimantan[b]									
Census	158	288	286	223	131	69	23	5.78	
SUPAS I	156	287	290	234	158	82	32	6.20	6.15
SUPAS II	129	293	283	218	166	75	26	5.95	5.86
Sulawesi[c]									
Census	129	289	298	244	148	71	25	5.90	
SUPAS I	137	288	307	252	170	80	34	6.34	6.34
SUPAS II	105	266	298	243	187	90	41	6.15	6.22
Total Indonesia									
Census	155	286	273	211	124	55	17	5.52	
SUPAS I	148	272	276	210	140	62	24	5.66	5.66
SUPAS II	130	259	261	208	143	65	24	5.46	5.45

Note: Figures for the provinces of West Nusa Tenggara, East Nusa Tenggara, Maluku, and Irian Jaya are not given.

a. Sumatra includes the eight provinces of Aceh, Riau, Jambi, Bengkulu, Lampung, and North, West, and South Sumatra.

b. Kalimantan includes the four provinces of West, Central, South, and East Kalimantan.

c. Sulawesi includes the four provinces of North, Central, South, and Southeast Sulawesi.

Sources: Estimated from the 1971 census, SUPAS I (1976) own-children estimates (based on child mortality estimates from SUPAS II), and SUPAS II (1976).

ing at ages ending in 5 or 0; in SUPAS I and II, however, age heaping around age 5 does not appear to be a serious problem.

For age-specific fertility rates in 1967-70, Table 26 shows that agreement among the different sets of data is close except for the two age groups at the beginning and end of the reproductive span—15-19 years and 45-49 years. In the former case, the differences may be due to migration, which is selectively high for young women and probably results in frequent separation of children from their mothers. The deviation for the 45-49 age group has little impact on the overall fertility rate because fertility of women in this age category is only a small proportion of total fertility.

We have seen fairly convincing agreement between the fertility rates based on the 1971 census and the SUPAS for the same reference period—for both total rates and age categories. This agreement encourages us to use the estimated fertility rates from SUPAS I and II for the period 1971-75. (The mortality adjustment for the SUPAS I fertility estimates in this period was made using child mortality estimates derived from SUPAS II.) These data are presented in Table 27.

For Indonesia as a whole, SUPAS I shows an 11 percent decline in total fertility between the two periods (from 5.66 for 1967-70 to 5.08 for 1971-75); SUPAS II estimates show a 6 percent decline (from 5.46 to 5.12). The declines are observed in all age groups, with the most substantial decline (35 percent) in the lowest-fertility age group of 45-49 years. Remarkably similar declines (7-9 percent) are found in each major region. These results are discussed below in conjunction with other fertility data.

Using an extension of the own-children method, duration-specific marital fertility rates were derived from SUPAS II. (Strictly, the rates discussed here apply to ever-married rather than currently married women.) Table 28 presents duration-specific marital fertility rates of women aged 15-49 for the two periods 1967-70 and 1971-75. It appears that the decline in marital fertility took place primarily in Java and Bali; there seems to be no significant change in the marital fertility rates for other islands. The rates show control for the impact of nuptiality. For Java, the decline between the two periods of 1967-70 and 1971-75 was 5 percent. The pattern of differential fertility revealed by these rates is similar to the differential TFRs indicated in Tables 26 and 27.

Fertility Trends in the 1960s

Age-specific fertility rates by calendar years were calculated from the birth histories of the FM Survey (McDonald et al., 1976) for the six regions (86 percent of the population) that were sampled separately. A comparable series of cumulated fertilities up to age 35 can be constructed from 1957 onward. Selected time-period averages from these measures are shown in Table

Table 27. Age-Specific Fertility Rates and Total Fertility Rates, by Region, 1971-75: Indonesia

Province/region and source	Age-specific fertility rates							
	15–19	20–24	25–29	30–34	35–39	40–44	45–49	TFR
Jakarta								
SUPAS I	104	234	246	180	110	45	12	4.65
SUPAS II	105	242	246	169	98	45	13	4.59
West Java								
SUPAS I	162	280	267	208	118	58	19	5.56
SUPAS II	150	258	263	218	133	69	18	5.55
Central Java								
SUPAS I	114	251	236	181	109	48	11	4.74
SUPAS II	113	256	240	187	106	49	10	4.80
Yogyakarta								
SUPAS I	60	197	217	178	101	53	14	4.10
SUPAS II	50	197	233	189	112	69	16	4.33
East Java								
SUPAS I	122	223	201	151	86	43	16	4.21
SUPAS II	114	225	194	150	95	50	14	4.21
Total Java								
SUPAS I	128	248	233	178	103	49	15	4.76
SUPAS II	121	244	231	182	110	55	14	4.78
Bali								
SUPAS I	95	249	254	198	124	69	32	5.10
SUPAS II	87	259	243	206	139	78	42	5.27

Sumatra								
SUPAS I	119	296	289	239	145	71	24	5.91
SUPAS II	122	291	295	240	156	72	26	6.01
Kalimantan								
SUPAS I	126	263	272	211	131	69	25	5.48
SUPAS II	118	261	278	216	135	77	22	5.53
Sulawesi								
SUPAS I	110	268	292	234	153	76	25	5.78
SUPAS II	88	250	288	240	163	99	34	5.81
Total Indonesia								
SUPAS I	124	258	250	195	115	56	18	5.08
SUPAS II	117	254	251	200	123	62	18	5.12

Note: See footnotes, Table 26.

Source: Estimates from SUPAS I and II (1976).

Table 28. Duration-Specific Marital Fertility Rates of Women Aged 15–49, by Region, 1967–70 and 1971–75: Indonesia

Province/region and period	Duration since first marriage (years)																Ever-married TFR	Absolute difference in TFR
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15+		
Total Indonesia																		
1967–70	188	268	305	300	295	303	290	286	293	286	272	262	260	256	243	110	6.06	
1971–75	208	294	320	313	314	311	298	294	287	268	265	260	246	232	214	98	5.87	–.19
Jakarta																		
1967–70	236	344	361	323	283	271	261	279	307	284	242	234	232	198	211	102	5.82	
1971–75	304	380	352	351	332	306	285	263	270	252	225	238	227	195	184	84	5.61	–.21
West Java																		
1967–70	200	259	306	285	255	286	295	295	326	311	286	281	292	281	268	124	6.56	
1971–75	215	268	279	273	286	300	284	285	287	266	267	266	276	263	235	112	6.14	–.42
Central Java																		
1967–70	147	243	261	231	261	302	275	259	286	298	271	269	248	238	241	111	5.86	
1971–75	192	262	277	277	296	304	282	277	288	285	269	258	232	206	208	36	5.48	–.38
Yogyakarta																		
1967–70	185	275	270	258	271	289	303	291	250	251	249	208	229	246	209	103	5.46	
1971–75	185	284	315	297	256	251	267	258	243	238	251	258	211	199	197	84	5.07	–.39
East Java																		
1967–70	162	200	243	287	280	263	255	238	218	221	217	199	200	201	198	88	4.98	
1971–75	155	244	274	262	281	272	263	272	241	213	208	218	209	180	161	76	4.84	–.14
Total Java																		
1967–70	176	243	276	274	269	281	273	263	271	270	252	242	240	233	229	105	5.71	
1971–75	197	270	285	278	291	291	276	276	269	250	242	244	234	210	196	89	5.43	–.28

Bali																		
1967-70	151	324	372	368	355	325	347	329	295	284	254	256	266	270	264	108	6.02	
1971-75	171	345	427	385	371	357	285	266	298	247	234	230	194	202	204	99	5.64	−.38
Sumatra																		
1967-70	197	319	385	360	340	331	302	311	317	299	299	294	299	303	264	123	6.72	
1971-75	233	344	400	389	356	354	340	326	321	297	305	285	258	265	245	122	6.80	+.08
Kalimantan																		
1967-70	243	301	322	334	323	352	365	329	313	316	303	259	237	243	237	122	6.56	
1971-75	217	298	334	344	344	324	320	317	315	311	295	286	273	242	228	113	6.38	−.18
Sulawesi																		
1967-70	218	289	310	309	335	340	311	329	354	339	324	308	308	292	283	135	6.89	
1971-75	226	331	370	365	353	340	358	336	319	309	306	292	286	303	256	131	6.92	+.03

Table 29. Cumulated Fertility up to Age 35 from the FM and SUPAS II Surveys, by Region: Indonesia

	FM Survey						SUPAS II	
	1957-66		1967-70		1967-72		1967-70	
Region	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
West Java	4.95	5.00	5.35	5.22	5.04	4.99	4.60	4.54
Central Java	4.36	4.13	4.60	4.36	4.28	4.23	4.32	3.85
East Java	3.96	3.67	4.16	3.71	3.89	3.67	3.80	3.58
Bali	4.61	—	4.66	—	4.18	—	4.20	3.88
Sumatra	5.63	5.45	5.72	5.07	5.41	4.90	4.91	4.86
Sulawesi	5.06	4.76	5.22	4.62	4.93	4.40	4.69	4.42

29, along with corresponding indices from the SUPAS II own-children estimates. The births reported for the two years before the FM Survey showed a sharp decline from previous levels. The authors argue that this fall was due to data errors, a conclusion that receives powerful support below. If, as a rough approximation, it is assumed that the "missing" births were recorded as occurring in slightly earlier years, then the average fertility indices for 1967-72 will be more reliable than those for 1967-70. Table 29 demonstrates that the former are in better agreement, both with the 1957-66 averages and the SUPAS II results.

Although the comparisons show some inconsistencies—not surprising in view of the vulnerability of the calculations to a variety of biases—the general conclusions are clear. The FM measures show little, if any, difference between 1957-66 and 1967-72. There are indications of falls for Sumatran urban areas and Bali, but the latter inference depends on the very low reported births for 1971-72.

The agreement between indices for SUPAS II (1967-70) and the FM Survey (1967-72) is good for East Java and Bali and moderately good for Central Java and Sulawesi. The discrepancy is considerable for West Java and Sumatra. The most plausible explanation may be the effect of age errors in determination of the dividing point at 35 years. This uncertainty does not seriously alter the assessment of the relative fertility levels in the regions, with the lowest measure in East Java and the highest in Sumatra. The censoring at age 35 years is a limitation; however, since only just over one child per woman was born after that age in Indonesia, the broad conclusions should be applicable to the total fertility rates as well.

The Indonesian Fertility Survey (IFS)

The IFS (SUPAS III) was restricted to Java and Bali, covering about two-thirds of the population. In the SUPAS II estimates, the TFRs for Java plus

Table 30. Estimates of Total Fertility in Calendar Years from the Indonesian Fertility Survey, 1964–75: Java and Bali

Year	IFS	Fitted Model (relational Gompertz)
1964	5.53	
1965	5.90	
1966	5.42	5.12
1967	5.77	5.10
1968	5.42	5.09
1969	5.44	5.06
1970	5.61	5.03
1971	5.56	4.98
1972	5.23	4.92
1973	4.78	4.86
1974	3.95	4.80
1975	4.53	4.71

Bali in 1966–70 and 1971–75 were 5.12 and 4.80, respectively, compared with 5.46 and 5.15 for the whole of Indonesia. The differential of over 0.3 births per woman has to be borne in mind in comparisons of the two data sources. Table 30 shows TFRs by calendar years from 1964 calculated from the IFS birth histories, and also values derived from a fitted model. The IFS measures, which are taken from Supraptilah (1982), include estimates for fertility after age 45 for 1970–73 and after age 40 for 1964–69; any resulting biases will be small, however. The model is described below.

The IFS data record fertility levels for 1967–70 are not much different from the SUPAS I and II own-children estimates, but for 1971–75 the IFS estimate is lower than SUPAS I and II as the following table shows:

	1967–70	1971–75
SUPAS I	5.66	5.08
SUPAS II	5.46	5.12
IFS	5.56	4.81

Taken at face value, TFRs calculated from the IFS fell by 13 percent between 1966–70 and 1971–75 and by as much as 20 percent between 1966–70 and 1973–75 (if it is assumed that the deficiency of births in 1974 is due to displacement into the years on either side). The trend downward is much faster than that implied by the own-children estimates. There is, however, a need for caution. It has been established that a common bias in maternity history surveys is an overstatement of the numbers of births occurring some five to 15 years before the current time (the "Potter effect"). The displaced births may have come mainly from earlier times (more than 15 years before), or both from earlier times and from the transportation backward of births in the preceding few years. Well-studied examples of the two types are the Kenya Fertility Survey of 1978 (one of the WFS series) and the Pakistan National Impact Survey of 1963. The evidence suggests that the exact form of the birth displacement varies from survey to survey, but that it generally leads to either an apparent recent fall in fertility where none has occurred or an exaggeration of an existing trend.

It is not easy to prove that a "Potter effect" is present from internal comparisons within one data set unless the distortion is large. However, some indications exist in the IFS results. The simplest indication emerges from a comparison of the TFRs of cohorts and time periods. These measures for cohorts aged 40-44, 35-39, and 30-34 at the time of the survey are all estimated at close to 5.40 births per woman after extrapolation to the end of the childbearing period. The error from the extrapolation must be quite small, particularly for the age 40-44 and 35-39 cohorts; falling fertility would imply, if anything, slightly lower values. The women aged 45-49 reported only 5.15 births each, probably because of some omissions. In contrast, the time-period total fertilities for the calendar years 1964-70 average 5.58, suggesting an excess of births allocated to this period.

A more incisive examination is possible with the aid of models of fertility by age. Here, the Gompertz relational system was applied. The basic equation is $Y(x) = \alpha + \beta Y_s(x)$, where $Y(x) = - ln [- l_nF(x)/F]$, with $F(x)$ the cumulated fertility to age x and F the total fertility. The $Y_s(x)$ are the double logarithms of a standard pattern arrived at empirically. α and β are two parameters that vary the location and spread of the fertility rates by age. The most effective procedure for fitting the model to birth history data is to determine a β value from the patterns of rates by age for the middle cohorts (25-29 and 30-34 years at the time of the survey). Average α values are then found separately for each cohort and smoothed over time if necessary (Brass, 1981). Once the α and β fertility pattern parameters have been fixed, the level F is determined for each cohort to give the reported mean births per woman at the time of the survey. The fitting then does not alter the number of births recorded, but may reallocate them over time.

The fitted model gives greatly modified estimates of TFRs in calendar years. Although the reported and fitted averages for 1971-75 are about the same, the latter show a much slower fall, with correspondingly higher values in 1974 and 1975 and lower values in 1971. The discrepancy in 1966-70 is substantial. Closer examination shows that the deviations of the observed measures from the fitted ones are due to the discrepant patterns of births over time for the cohorts of women aged 25–29, 30–34, and 35–39. At younger ages, the agreement is satisfactory; at later ages, the distortions mainly affect the fertility in earlier calendar years. For example, the age 30–34 cohort of women reported births per 1,000 as 264, 258, 259, and 268 in 1971, 1970, 1969, and 1968, respectively, as compared with the model estimates of 226, 234, 241, and 248 (on average 10 percent lower). It is impossible to find a pattern from the model system, which reasonably graduates the observations, without arriving at estimates of births in 1968–71 considerably lower than those reported. It can of course be argued that the standard pattern is not appropriate for Indonesia, and that a more peaked configuration would give better agreement between model and observations. Since the "excess births" relative to the model occur at increasingly later ages as the cohorts become older, it is not clear that changing the pattern would greatly modify the results.

The TFRs estimated from the relational Gompertz fitting increase gradually as time recedes, to around 5.4 in the late 1950s. They become increasingly vulnerable to omissions by older women, for which no allowance has been made. The method may also smooth out sharper time-period changes and translate them into gradual trends. The estimates show a decrease in fertility of about 8 percent from 1966–75, with another 5 percent overall decrease occurring earlier. It is possible that some of the 5 percent can be allocated to the latter period, giving a downward trend of about 1 percent per year.

Children Ever Born, SUSENAS, 1979

The multi-purpose National Socio-Economic Survey (SUSENAS) of 1979 included a module of questions on fertility and family planning. The only relevant measures of fertility calculated are the mean parities by age group of women. Table 31 compares the results for Java plus Bali with the corresponding measures from the IFS.

The agreement between the two sets of reported mean parities is remarkably close. However, if fertility had fallen by 1975 to the extent suggested by the IFS measures, the mean parities for the cohorts should have fallen by 1979. The projected mean parities in the table were arrived at by adding births at the average age-specific rates reported for 1973–75 in the IFS. By 1979, the cohort effects should have been appreciable, particularly for women aged 25–34. Although refined assessment is impossible in such a comparison because of response and sample errors in the different surveys, the lack of any sign of a trend makes it difficult to accept the IFS fertility measures for 1973–75 as valid.

Table 31. Mean Parities for Women as Reported in the Indonesian Fertility Survey (IFS), 1976, and the National Socio-Economic Survey (SUSENAS), 1979: Java and Bali

	IFS, 1976		SUSENAS, 1979
Age of women	Reported	Projected to 1979	Reported
15–19	0.198	—	0.232
20–24	1.248	1.160	1.256
25–29	2.557	2.407	2.587
30–34	3.902	3.645	3.827
35–39	4.707	4.586	4.779
40–44	5.241	5.141	5.179
45–49	5.153	—	5.231

The 1980 Census

At the time this report was prepared, the only data available from the September 1980 census that could be used for fertility estimates was the single-year age distribution. Despite its limitations, this evidence is crucial to resolving the uncertainties about trends. If the rate of fertility decline in the early 1970s was anywhere near as rapid as that indicated by the unadjusted IFS reports, the results should appear in the numbers of children. The TFRs in Table 32 have been derived by conventional reverse-survival techniques. The life table constructed for the mid-1970s in Chapter 3 was used to estimate the numbers of births, in each of the sixteen years before the census, required to give the survivors at single years of age in September 1980. Similarly estimated were the numbers of women in five-year age groups at the time of the births. The TFRs were taken at levels that would give the determined numbers of births to women with the age-specific fertility pattern of the SUPAS II estimates for 1971–75. Alternative plausible patterns were examined, but the differences in estimates were negligible. The IFS data on child mortality indicate that rates changed little in the late 1960s and the first half of the 1970s. Therefore, it seemed unnecessary to incorporate highly speculative adjustments for falling mortality, although the possibility will be considered when the estimates for the late 1970s are assessed.

The TFRs based on the raw data suggest, anomalously, that the level went up from 5.35 in 1967–70 to 5.53 in 1971–75, although there was a substantial fall thereafter. An examination of the single-year measures reveals that the comparative regularity of the age numbers at ages under 7 may partly disguise considerable distortion. The high concentrations of births in 1970–73 (ages 7–10) has no supporting evidence, and the sharp troughs

Table 32. Estimates from Reverse Survival, 1980 Census: Indonesia

Year to September	Total fertility	Average	Three-year average	Adjusted total fertility	Average	Three-year average
1965	5.57					
1966	4.71			4.90		
1967	4.83	5.35	5.16	5.02	5.50	5.37
1968	5.95		5.14	6.19		5.35
1969	4.64		5.52	4.83		5.66
1970	5.96		5.46	5.96		5.42
1971	5.79	5.53	5.79	5.47	5.34	5.58
1972	5.63		5.76	5.32		5.44
1973	5.85		5.54	5.53		5.33
1974	5.13		5.40	5.13		5.30
1975	5.23		5.16	5.23		5.16
1976	5.13		5.10	5.13		5.10
1977	4.93		4.91	4.93		4.91
1978	4.68			4.68		
1979	4.09					
1980	3.77					

in 1969, 1967, and 1966 (ages 11, 13, and 14) demonstrate the unreliability of age reporting. An analysis of the age errors discussed in Chapter 2 suggests that the numbers at ages 10–14 may have been understated by 3.1 percent and those at ages 5–9 inflated by 3.3 percent. A rough adjustment consistent with this has been applied by increasing the TFRs in 1966–69 by 4 percent and reducing those in 1971–73 by 5.5 percent. The resulting measures give a more sensible configuration. For example, the fertility level in 1967–70 is in rough agreement with the SUPAS I and II and 1971 census own-children estimates. To obtain results similar to IFS direct reports, a massive reallocation would be required, with numbers at ages 10–14 being increased and at ages 5–9 reduced by some 9 percent. A transposition of this size would make no sense in relation to the numbers in the early adult ages, particularly ages 15–19.

The Fertility Trend

Table 33 draws together various estimates from which fertility trends can be assessed. All have been described above except the simple, direct calculation from comparison of the 1980 and 1971 censuses, which was carried out as follows:

	1971	1980	Ratio of 1980/1971
Ratio of children aged 1–4 to 1,000 women aged 22–41	956	855	.894
Ratio of children aged 2–5 to 1,000 women aged 22–41	945	867	.917
Average			.906

There were clear deficiencies in the ratio of children aged 1–4, which was much greater in 1971 than 1980. The age range of women was chosen to include the great majority of mothers of children in the numerator, and to reduce the errors of digit preference. The reduction in the ratios between the two censuses is a measure of the fertility trend. The average was applied to the own-children estimate of total fertility from the 1971 census to give the value approximately located in 1976–78.

Apart from the unadjusted IFS results, the picture is reasonably coherent. Total fertility was about 5.5 in 1967–70 and not much different back to the late 1950s. By 1971–75, it was around 5.2. In the late 1970s, the rate had fallen to perhaps 4.8, including an allowance for an expected decrease in infant mortality. A regular downward trend in fertility of about 1 percent a year is suggested.

Own-children estimates from the 1980 census have recently become available and are shown in the last column of Table 33. The agreement between the own-children and the reverse-survival estimates is very close. For the two later periods, 1971–75 and 1976–78, the two estimates are essentially identical. For the earlier period, 1967–70, the own-children estimate is about 6 percent below the reverse-survival estimate. The own-children estimates thus confirm the overall picture of fertility change presented here.

Table 33. Estimates of Trends in Total Fertility: Indonesia

		IFS[a]			1980 census	
Period	SUPAS II	Reported	Adjusted	1971 and 1980 censuses	Adjusted reverse survival	Own-children
1967–70	5.46	5.91	5.42	5.52	5.50	5.19
1971–75	5.12	5.16	5.20		5.34	5.36
1976–78				5.00	4.91	4.83

a. 0.35 has been added to each measure to allow roughly for the differential between Java plus Bali and the whole of Indonesia.

The 1980 census age-distribution estimates show a rapid fertility decline in the three years before the census. However, this could easily be explained by a combination of omissions of very young children and age errors. Something similar occurred in the 1971 census, although the pattern was not exactly the same. In addition, it is now clear that the births in the preceding two or three years were considerably underreported in both the IFS and the FM Survey, presumably because of time location errors. This experience emphasizes the dangers of drawing conclusions about current fertility levels from such exercises; the data are not strong enough to determine whether the rate of fertility decline was accelerating in the late 1970s.

Contraceptive Prevalence

According to the 1976 Indonesian World Fertility Survey in Java and Bali 28 percent of currently married women aged 15-44 were using contraception (modern and traditional methods). Prevalence was highest among women in their 30s, although the differentials by age were not large, except for the age group 15-19, as shown here:

Age group	Percentage currently using contraception
15-19	13
21-24	27
25-29	33
31-34	34
35-39	31
41-44	23

Only 13 percent of married women with one child or none used contraception, compared with slightly more than a third of the women with two or more living children. There was little difference between the level of contraceptive prevalence among women living in urban and rural areas, i.e., 27 and 31 percent. However, when examined by both parity and residence, a clear difference emerges. In the urban areas, nearly half of the women with four or more living children were using contraception in 1976, compared with only 34 percent of those in the rural areas.

Number of children	Residence	
	Urban	Rural
0-1	8	14
2-3	35	35
4+	46	34

A 1983 survey (Contraceptive Prevalence Survey) of five cities showed that prevalence ranged from 33 percent in Ujung Pandang to 54 percent in Semarang, with Medan (36 percent), Jakarta (44 percent), and Surabaya (47 percent) at intermediate levels. The differences by parity among these urban women remained; for example, among women with 0–1 and 4+ children, prevalence ranged from 19 to 44 percent in Jakarta, from 19 to 59 percent in Surabaya, and from 31 to 66 percent in Semarang.

The National Family Planning Coordinating Board calculates prevalence of modern contraceptive methods on a continuous basis, using data on new acceptors of family planning and continuation rates obtained from special studies. This series shows that for the country as a whole, among currently married women 15–44, prevalence increased from 1 percent in 1971 to 17 percent in 1976, to 36 percent in 1981, and to 39 percent in 1982. (The years refer to the Indonesian fiscal year, April 1 through March 31.) The 1976 estimate for Java and Bali—21 percent for modern methods—compares favorably with the estimate of 28 percent for current use obtained for that year from the World Fertility Survey. The WFS figure includes both modern and traditional methods, making the differences smaller. The WFS reports also provide estimates of ever use of modern or traditional contraceptive methods: any method, 41 percent; any traditional method, 11 percent; any modern method, 36 percent. The latter two numbers indicate that some women used both modern and traditional methods, since the total of both types is more than 41 percent. The WFS findings suggest that perhaps one fifth to one quarter of the total prevalence in 1976 was traditional methods. This means that current use of modern methods in Java and Bali at the time of the survey was about 21–23 percent, close to the 21 percent estimated by the program.

REFERENCES

Alatas, S. (1974). Evalusai mengenai Jumlah Penduduk, Komposisi Umur dan Jenis Kelamin dalam Penerbitan Hasil Sensus 1971. *Majalah Demografi Indonesia* 2:89–115.

Al Hadar, Y. (1977). *Marriage and Divorce in Indonesia: A Cross-Cultural Study.* Demographic Institute. Jakarta: University of Indonesia.

Anderson, B. R. O. G. (1972). *Java in a Time of Revolution: Occupation and Resistance 1944–1946.* Ithaca, N.Y.: Cornell University Press.

Brass, W. (1981). The Use of the Gompertz Relational Model to Estimate Fertility. Pp. 345–362 in *International Populaltion Conference, Manila,* Vol. 3. Liège: International Union for the Scientific Study of Population.

Brass, W., and E. A. Bamgboye (1981). The time location of reports of survivorship: Estimates for maternal and paternal orphanhood and the ever-widowed. Working Paper No. 81-1, Center for Population Studies, London School of Hygiene and Tropical Medicine.

Brass, W., and S. Swamy (1980). Measurement of death registration completeness using the growth balance procedure applied to data from India. *Asian and Pacific Census Forum* 7(1):5–8.

Budi Utomo (1978). Analysis of age reporting in Indonesia, 1971 and 1976. Paper prepared for the Indonesian Panel of the Committee on Population and Demography Workshop, National Academy of Sciences, Washington, D.C.

Cho, L.-J. (1973). The own-children approach to fertility estimation: An elaboration. Pp. 263–278 in *International Population Conference,* Vol. 2. Liège: International Union for the Scientific Study of Population.

Cho, L.-J., S. Suharto, G. McNicoll, and S. G. M. Mamas (1976). *Estimates of Fertility and Mortality in Indonesia.* Report SP 76-L02. 1971 Population Census of Indonesia. Jakarta: Central Bureau of Statistics.

Cho, L.-J., S. Suharto, G. McNicoll, and S. G. M. Mamas (1980). *Population Growth of Indonesia: An Analysis of Fertility and Mortality Based on the 1971 Population Census.* Monographs of the Center for Southeast Asian Studies, Kyoto University. English-language Series, No. 15. Honolulu: University Press of Hawaii.

Demographic Factbook of Indonesia (1973). Jakarta: Lembaga Demografi, Fakultas Ekonomi, Universitas Indonesia.

Feeney, G. (1979). A technique for correcting age distributions for heaping on multiples of five. *Asian and Pacific Census Forum* 5(3):12–14.

Gardiner, P. (1978). Age patterns of mortality in Indonesia: An analysis of results of the Indonesian Sample Vital Registration Project 1974–77. Paper prepared for the Indonesian Panel of the Committee on Population and Demography, National Academy of Sciences, Washington, D.C.

Gille, H., and R. H. Pardoko (1966). A family life study in East Java: Preliminary findings. In B. Berelson et al., eds., *Family Planning and Population Programs: A Review of World Developments*. Chicago: University of Chicago Press.

Hajnal, J. (1953). Age at marriage and proportions marrying. *Population Studies* 7(2):111-136.

Heligman, L. (1974). *Levels and Trends of Mortality in Indonesia, 1961-1971*. International Statistical Program Center, Bureau of the Census. Washington, D.C.: U.S. Department of Commerce.

Hill, K. H., A. Packer, G. A. Maccio, and J. L. Samoza (1976). *National Demographic Survey of Honduras: Methodology. Results. Indirect Estimates*. Tegucigalpa and Santiago: Directorate General of Census and Statistics of Honduras and the Latin American Demographic Centre (CELADE).

Hull, T. H. (1978). An estimate of infant mortality in Indonesia in 1975. Yogyakarta: Population Studies Institute, Gadjah Mada University.

Hull, T. H., and Sunaryo (1978). Levels and trends in infant and childhood mortality in Indonesia. Paper prepared for the Indonesia Panel of the Committee on Population and Demography, National Academy of Sciences, Washington, D.C.

Indonesia, Biro Pusat Statistik (1972). *1971 Population Census: Advance Tables*. Jakarta: Biro Pusat Statistik.

Indonesia, Biro Pusat Statistik (1976). *1976 Intercensal Population Survey: Organization and Methods*. SUPAS Technical Report Series, Monograph No. 1. Jakarta: Biro Pusat Statistik.

Indonesia, Biro Pusat Statistik (1977). *Fertility of the Indonesian Population*. 1976 Intercensal Population Survey, Tabulation Series, No. 1. Jakarta: Biro Pusat Statistik.

Indonesia, Biro Pusat Statistik (1978). *Indonesia Fertility Survey 1976: Principal Report*, 2 vols. Jakarta: Biro Pusat Statistik.

Indonesia, Biro Pusat Statistik (1979). *Analysis and Evaluation of the Sample Vital Registration Project 1974-1977*. Sample Vital Registration Team, Technical Report Series, Monograph No. 6. Jakarta: Biro Pusat Statistik.

Indonesia, Biro Pusat Statistik (1983). *Proyeksi Penduduk Indonesia 1980-2000*. Jakarta: Biro Pusat Statistik.

Kabir, M. (1978). Estimation of mortality of Indonesia for the period 1961-71 from intercensal survivorship ratios. *Majalah Demografi Indonesia* 12(10):71-81.

Keyfitz, N. (1964). Population in Indonesia, the short and long run. In *Workshop Masalah Penduduk, 21-24 May, 1964*. Jakarta: Lembaga Penyelidikan Ekonomi dan Masyarakat, Universitas Indonesia.

Keyfitz, N. (1965). Age distribution as a challenge to development. *American Journal of Sociology* 70:659–668.

Keyfitz, N. (1972). Untitled and unpublished report to the Director of the Central Bureau of Statistics, Jakarta.

McDonald, P. F. (1974). *Marriage in Australia: Age at First Marriage and Proportions Marrying, 1860–1971.* Australian Family Formation Project, Monograph 2, Department of Demography. Canberra: Australian National University.

McDonald, P. (1978a). The age pattern of mortality in Indonesia: A comment. *Majalah Demografi Indonesia* (9):1–8.

McDonald, P. (1978b). Adult mortality in Indonesia: An examination of evidence from the 1961 and 1971 censuses and the 1976 Intercensal Survey. Paper prepared for the Indonesian Panel of the Committee on Population and Demography, National Academy of Sciences, Washington, D.C.

McDonald, P. (1979). Nuptiality patterns in Indonesia. Paper prepared for the Indonesian Panel of the Committee on Population and Demography, National Academy of Sciences, Washington, D.C.

McDonald, P. F., M. Yasin, and G. Jones (1976). *Levels and Trends in Fertility and Childhood Mortality in Indonesia.* Jakarta: Demographic Institute, University of Indonesia.

McNicoll, G., and S. G. M. Mamas (1973). *The Demographic Situation in Indonesia.* Papers of the East-West Population Institute, No. 28. Honolulu: East-West Center.

Muliakusuma, S. (1976). *Various Aspects of Current Differences in Marriage Patterns in Indonesia.* Demographic Institute. Jakarta: University of Indonesia.

National Academy of Sciences (1983). *Fertility Decline in Indonesia: Analysis and Interpretation.* Committee on Population and Demography Report No. 20. Washington, D.C.: National Academy Press.

Picouet, M. (1969). Etude de la structure par âge de la population tunisienne à partir de l'examen des pyramides d'âges. *Revue Tunisienne de Sciences Sociales* 6(17–18):177–194.

Potter, J. E. (1977). Problems in using birth-history analysis to estimate trends in fertility. *Population Studies* 31(2):335–364.

The problem of rice (1966). (Stenographic notes on the Fourth Session of the Sanyo Kaigi, January 8, 2605, i.e., 1945.) *Indonesia* (Ithaca, New York), No. 2:77–123.

Singarimbun, M., and C. Manning (1974). *Fertility and Family Planning in Mojolama.* Yogyakarta: Institute of Population Studies, Gadjah Mada University.

Sinquefield, J. C., and A. Kartoyo (1977). Using retrospective mortality data to test the applicability of model life tables for Indonesia. *Majalah Demografi Indonesia* (7):25–41.

Speare, A. (1978). An adjusted age distribution for Indonesia based on destabilizing population methods. Mimeo, National Institute for Economic and Social Research, Jakarta.

Stoto, M. A. (1981). Advances in mathematical models for Population projections. In *International Population Conference, Manila 1981*, Vol. 3. Liège: IUSSP.

Suharto, S., and L.-J. Cho (1978). *Preliminary Estimates of Indonesian Fertility Based on the 1976 Intercensal Population Survey.* Papers of the East-West Population Institute, No. 52. Honolulu: East-West Center.

Suharto, S., G. McNicoll, and L.-J. Cho (1976). The 1971 population census of Indonesia. Pp. 77–83 in L.-J. Cho, ed., *Introduction to Censuses of Asia and the Pacific 1970–74.* Honolulu: East-West Population Institute, East-West Center.

Supraptilah, B. (1982). *Evaluation of the Indonesian Fertility Survey 1976.* WFS Scientific Report No. 38. London: World Fertility Survey.

United Nations (1965). *Demographic Yearbook 1964.* New York: United Nations.

United Nations (1967). *Methods of Estimating Basic Demographic Measures from Incomplete Data.* Manuals on Methods of Estimating Population, IV. New York: United Nations.

U.S. Bureau of the Census (1979). *Country Demographic Profiles: Indonesia.* Washington, D.C.: U.S. Department of Commerce.

van de Walle, E. (1966). Some characteristic features of census age distributions in illiterate populations. *American Journal of Sociology* 7:549–555.

Widjojo Nitisastro (1961). Migration, population growth and economic development in Indonesia. Ph.D. dissertation, University of California, Berkeley.

Widjojo Nitisastro (1970). *Population Trend in Indonesia.* Ithaca, N.Y.: Cornell University Press.

World Fertility Survey (1978). *An Assessment of the Reliability of the Indonesian Fertility Survey.* London: World Fertility Survey.

Zaba, B. (1979). The four-parameter logit life table system. *Population Studies* 33:79–100.

GLOSSARY

Age Heaping. A tendency for enumerators or respondents to report certain ages instead of others; also called age preference or digit preference. Preference for ages ending in 0 or 5 is widespread.

Age Pattern of Fertility. The relative distribution of a set of age-specific fertility rates. It expresses the relative contribution of each age group to total fertility.

Age Ratio. The ratio of the population in a given age group to the average of the populations in the two neighboring age groups, times 100.

Age-Specific Fertility Rate. The number of births occurring during a specified period to women of a specified age or age group, divided by the number of person-years lived during that period by women of that age or age group. When an age-specific fertility rate is calculated for a calendar year, the number of births to women of the specified age is usually divided by the mid-year population of women of that age.

Age-Specific Mortality Rate. The number of deaths occurring during a specified period to persons (usually specified by sex) of a specified age or age group, divided by the number of person-years lived during that period by the persons of that age or age group. When an age-specific mortality rate is calculated for a calendar year, the number of deaths to persons of the specified age is usually divided by the mid-year population of persons of that age. Age-specific mortality rates are generally denoted by ${}_nM_x$, the annual death rate to persons aged x to $x + n$.

Age Standardization. A procedure of adjustment of crude rates (birth, death, or other rates) designed to reduce the effect of differences in age structure when comparing rates for different populations.

Birth History. A report of the number and dates of all live births experienced by a particular woman; see also *pregnancy history*. The sex of each child, the survival of each child to the date of the interview, and, where pertinent, the date of death are also generally recorded.

Birth Order. The ordinal number of a given live birth in relation to all previous live births of the same woman (e.g., 5 is the birth order of the fifth live birth occurring to the same woman).

Birth Rate. See *crude birth rate.*

Chandrasekaran-Deming Technique. A procedure to estimate the coverage of two independent systems collecting information about demographic or other events, based on the assumption that the probability of an event being recorded by one system is the same whether or not the event is recorded by the other system. The events from both systems are matched to establish M, the number of events recorded by both systems; U_1, the number recorded only by system 1; and U_2, the number recorded only by system 2. The Chandrasekaran–Deming formula then estimates total events, N, as

$$\hat{N} = M + U_1 + U_2 + \frac{U_1 U_2}{M} .$$

Childbearing Ages. The span within which women are capable of bearing children, generally taken to be from age 15 to age 49 or, sometimes, to age 44.

Children Ever Born(e). The number of children ever borne alive by a particular woman; synonymous with parity. In demographic usage, stillbirths are specifically excluded.

Cohort. A group of individuals who experienced the same class of events in the same period. Thus an age cohort is a group of people born during a particular period, and a marriage cohort is a group of people who married during a particular period. The effects of a given set of mortality or fertility rates are often illustrated by applying them to hypothetical cohorts.

Cohort Fertility. The fertility experienced over time by a group of women or men who form a birth or a marriage cohort. The analysis of cohort fertility is contrasted with that of period fertility.

Crude Birth Rate. The number of births in a population during a specified period divided by the number of person-years lived by the population during the same period. It is frequently expressed as births per 1,000 population. The crude birth rate for a single year is usually calculated as the number of births during the year divided by the mid-year population.

Crude Death Rate. The number of deaths in a population during a specified period divided by the number of person-years lived by the population during the same Period. It is frequently expressed as deaths per 1,000 population. The crude death rate for a single year is usually calculated as the number of deaths during the year divided by the mid-year population.

Cumulated Fertility. An estimate of the average number of children ever borne by women of some age x, obtained by cumulating *age-specific fertility rates* up to age x; also often calculated for age groups.

Death Rate. See *crude death rate.*

De Facto Population. A population enumerated on the basis of those present at a particular time, including temporary visitors and excluding residents temporarily absent. See *de jure population.*

De Jure Population. A population enumerated on the basis of normal residence, excluding temporary visitors and including residents temporarily absent. See *de facto population.*

Digital Preference. See *age heaping.*

Dual Record System. See *Chandrasekaran–Deming technique.*

Expectation of Life at Birth. The average number of years that a member of a cohort of births would be expected to live if the cohort were subject to the mortality conditions expressed by a particular set of *age-specific mortality rates.* Denoted by the symbol $e(0)$ in *life table* notation.

Fertility History. Either a birth history or a pregnancy history.

Forward Survival. A procedure for estimating the age distribution at some later date by projecting forward an observed age distribution. The procedure uses survival ratios, often obtained from model life tables. The procedure is basically a form of population projection without the introduction of new entrants (births) to the population.

General Fertility Rate. The ratio of the number of live births in a period to the number of person-years lived by women of childbearing ages during the period. The general fertility rate for a year is usually calculated as the number of births divided by the number of women of childbearing ages at mid-year.

Gross Reproduction Rate. The average number of female children a woman would have if she survived to the end of her childbearing years and if, throughout, she were subject to a given set of age-specific fertility rates and a given sex ratio at birth. This number provides a measure of replacement fertility in the absence of mortality.

Growth Rate. The increase or decrease of a population in a period divided by the number of person years lived by the population during the same period. The increase (or decrease) in a population is the result of a surplus (or deficit) of births over deaths and a surplus (or deficit) of immigrants over emigrants. (The annual increase is often expressed as a fraction of the total population at the beginning of the year, but this convention has the inconvenient characteristic of not being readily defined for a five-year interval and of being unequal to the difference between the birth rate and the death rate even in the absence of migration.) See also *rate of natural increase.*

Infant Mortality Rate. The number of deaths of children under 1 year of age occurring in the same year; also used in a more rigorous sense to mean the number of deaths that would occur under 1 year of age in a *life table* with a *radix* of 1,000, in which sense it is denoted by ${}_1q_0$.

Life Table. A listing of the number of survivors at different ages (up to the highest age attained) in a *hypothetical* cohort subject from birth to a particular set of *age-specific mortality rates.* The rates are usually those observed in a given population during a particular period of time. The survivors of the radix to age x are generally denoted by $l(x)$. The tabulations commonly accompanying a life table include other features of the cohort's experience: its expectation of life at each age x, denoted by $e(x)$; the probability of surviving from each age x to age $x + n$, denoted by ${}_nq_x$; the person-years lived by the hypothetical cohort as it ages from age x to age $x + n$, denoted by ${}_nL_x$ (also equivalent to the population aged $x, x + n$ in a *stationary population* experiencing a number of births each year equal to the *radix* of the life table); and the person-years lived by the hypothetical cohort from age x onward, denoted by $T(x)$.

Logit. The logit of a proportion p is $\frac{1}{2} \ln[p/(1 - p)]$. As a linearizing transformation, the logit has been proposed as the basis of a model life table system in which the logit of a probability of dying by age x (${}_xq_0$) is related linearly to the logit of a standard probability of dying by age x (${}_xq_0^s$) so that

$$\text{logit } ({}_xq_0) = \alpha + \beta \,[\text{logit } ({}_xq_0^s)],$$

where α is a measure of mortality level relative to the standard and β is a parameter that alters the shape of the standard mortality function.

Marital Fertility. Any measure of fertility in which the births (in the numerator) are births to married women and in which the number of person-years lived (in the denominator) also pertains to married women. In some instances, the designation "married" includes persons in consensual unions.

Mean Age at Childbearing. The average age at which a mortality-free cohort of women bear their children according to a set of *age-specific fertility rates.*

Mean Age at Childbearing in the Population. The average age of the mothers of the children born in a population during a year. This measure incorporates the effects of both mortality and the age distribution.

Median. The value associated with the central member of a set that is ordered by size or some other characteristic expressed in numbers.

Migration Rate. Number of migrants during a specified period divided by the person-years lived of the population exposed to migration. See also *population change due to migration.*

Model Life Table. An expression of typical mortality experience derived from a group of observed life tables.

Moving Averages. The successive averaging of two or more adjacent values of a series in order to remove sharp fluctuations.

Myers's Index. An index of digit preference that essentially sums in turn the population ending in each digit over some age range, often 10–89, expressing the total as a percentage of the total population, and which avoids the bias introduced by the fact that the population is not evenly distributed among all ages by repeating the calculations 10 times, once for each starting digit, and averaging the results. The difference between the average percentage for each digit and the expected value of 10 percent provides a measure of the preference for or avoidance of the digit over the age range considered.

Natural Fertility. The age pattern of *marital fertility* observed in noncontraceptive populations where reproductive behavior is not affected by the number of children already born.

Net Migration. The difference between gross immigration and gross emigration.

Net Reproduction Rate. The average number of female children born per woman in a *cohort* subject to a given set of *age-specific fertility rates,* a given set of *age-specific mortality rates,* and a given *sex ratio at birth.* This rate measures replacement fertility under given conditions of fertility and mortality. It is the ratio of daughters to mothers, assuming continuation of the specified conditions of fertility and mortality.

Own-Children Method. A refinement of the *reverse-survival* procedure for fertility estimation, whereby estimates of *age-specific fertility rates* for the recent past are obtained by relating mothers to their own children, using information on relationship and other characteristics available from a census or survey.

Parity. See *children ever born.*

Partial Birth Rate. The proportion of the population that enters (that is, is "born" into) a given age category in a year. The age categories used are normally open-ended; thus the partial birth rate $x+$ designates the proportion of the population becoming x years and older.

Partial Death Rate. The proportion of the population that leaves (that is, "dies" out of) a given age category in a year. See *partial birth rate.*

Period Fertility. The fertility experienced during a particular period of time by women from all relevant birth or marriage *cohorts.* See also *cohort fertility.*

P/F Ratio Method. A consistency check for survey information on fertility. Information on recent fertility is cumulated to obtain measures that are equivalent to average parities. Lifetime fertility in the form of reported average parities by age group P can then be compared for consistency with the parity-equivalents F by calculating the ratio P/F for successive age groups. If certain assumptions about error patterns are met, an improved estimate of fertility can sometimes be obtained by correcting the age pattern of current fertility to agree with the level of lifetime fertility reported by younger women.

Population Change Due to Migration. The sum of in-migrants minus out-migrants during a specified period of time. The change may also be expressed as a rate by dividing the change by person-years lived in the population during the same period.

Pregnancy History. A report of the number and the dates of occurrence of all the pregnancies experienced by a particular woman. The outcome of the pregnancy—live birth, stillbirth, or fetal death—is also recorded.

Radix. The hypothetical birth *cohort* of a *life table.* Common values are 1, 1,000, and 100,000.

Rate of Natural Increase. The difference between the births and deaths occurring during a given period divided by the number of person-years lived by the population during the same period. This rate, which specifically excludes changes resulting from migration, is the difference between the *crude birth rate* and the *crude death rate.*

Retrospective Survey. A survey that obtains information about demographic events that occurred in a given past period, generally terminating at the time of the survey.

Reverse Projection. See *reverse survival.*

Reverse Survival. A technique to estimate an earlier population from an observed population, allowing for those members of the population who would have died according to observed or assumed mortality conditions. It is used as a method of estimating fertility by calculating from the observed number of survivors of a given age x the expected number of births that occurred x years earlier. (In situations for which both fertility and mortality are known or can be reliably estimated, reverse survival can be used to estimate migration.)

Robustness. A characteristic of estimates that are not greatly affected by deviations from the assumptions on which the estimation procedure is based.

Sex Ratio at Birth. The number of male births for each female birth, or male births per 100 female births.

Singulate Mean Age at Marriage (SMAM). A measure of the mean age at first marriage, derived from a set of proportions of people single at different ages or in different age groups, usually calculated separately for males and females.

Stable Population. A population exposed for a long time to constant fertility and mortality rates, and closed to migration, establishes a fixed age distribution and constant growth rate characteristic of the vital rates. Such a population, with a constant age structure and constant rate of growth, is called a *stable population.*

Stationary Population. A *stable population* that has a zero growth rate, with constant numbers of births and deaths per year. Its age structure is determined by the mortality rates and is equivalent to the person-years lived ($_nL_x$) column of a conventional life table.

Survival Ratio. The probability of surviving between one age and another; often computed for age groups, in which case the ratios correspond to those of the person-years-lived function, $_nL_x$, of a life table. Also called *survivorship probabilities.*

Survivorship Probabilities. See *survival ratio.*

Synthetic Parity. The average parity calculated for a hypothetical cohort exposed indefinitely to a set of period age-specific fertility rates.

Total Fertility Rate (TFR). The average number of children that would be born per woman if all women lived to the end of their childbearing years and bore children according to a given set of *age-specific fertility rates;* also referred to as *total fertility.* It is frequently used to compute the consequence of childbearing at the rates currently observed.

United Nations Age–Sex Accuracy Index. An index of age-reporting accuracy that is based on deviations from the expected regularity of population size and sex ratio, age group by age group. The index is calculated as the sum of (1) the mean absolute deviation from 100 of the age ratios for males, (2) the mean absolute deviation from 100 of the age ratios for females, and (3) three times the mean of the absolute difference in reported sex ratios from one age group to the next. The United Nations defines age-sex data as "accurate," "inaccurate," or "highly inaccurate" depending on whether the index is less than 20, 20 to 40, or greater than 40.

Whipple's Index. A measure of the quality of age reporting based on the extent of preference for a particular target digit or digits. The index essentially compares the reported population at ages ending in the target digit or digits with the population expected on the assumption that population is a linear function of age. For a particular age range, often 23 to 62, the population with ages ending in the target digits is divided by one-tenth of the total population, the result then being multiplied by 100 and divided by the number of different target digits. A value of 100 indicates no preference for those digits, whereas values over 100 indicate positive preference for them.

RECENT AVAILABLE PAPERS OF THE EAST-WEST POPULATION INSTITUTE

No.

86 **The effects of induced abortion on subsequent reproductive function and pregnancy outcome: Hawaii,** by Chin Sik Chung and Patricia G. Steinhoff in collaboration with Roy G. Smith and Ming-Pi Mi. June 1983, xii + 144 pp.

60-F **Influences on childbearing intentions across the fertility career: demographic and socioeconomic factors and the value of children,** by Rodolfo A. Bulatao and James T. Fawcett. June 1983, x + 152 pp.

87 **Population mobility and wealth transfers in Indonesia and other Third World societies,** by Graeme J. Hugo. July 1983, vi + 50 pp.

88 **Structural change and prospects for urbanization in Asian countries,** by Gavin W. Jones. August 1983, vi + 46 pp.

89 **Urban growth and local taxes in less developed countries,** by Roy Bahl, Daniel Holland, and Johannes Linn. September 1983, vi + 33 pp.

90 **A false fertility transition: the case of American blacks,** by Paul Wright and Peter Pirie. February 1984. viii + 81 pp.

60-G **The old-age economic security value of children in the Philippines and Taiwan,** by Susan De Vos. March 1984, viii + 72 pp.

91 **A profile of Hawaii's elderly population,** by Eleanor C. Nordyke, Richard K.C. Lee, and Robert W. Gardner. August 1984, viii + 39 pp.

92 **City characteristics, migration, and urban development policies in India,** by Mahendra K. Premi with Judith Ann L. Tom. June 1985, viii + 127 pp.

93 **Urbanization in China: new insights from the 1982 Census,** by Sidney Goldstein. July 1985, vi + 73 pp.

94 **Comparison of fertility trends estimated alternatively from birth histories and own children,** by Robert D. Retherford and Iqbal Alam. July 1985, viii + 39 pp.

95 **Population mobility in the People's Republic of China,** by Sidney Goldstein and Alice Goldstein. October 1985, vi + 46 pp.

96 **Factors in the achievement of below-replacement fertility in Chiang Mai, Thailand,** by Tieng Pardthaisong. March 1986, viii + 46 pp.

97 **The Population of Burma: An analysis of the 1973 Census,** by M. Ismael Khin Maung. April 1986, viii + 32 pp.

98 **Population aging in Australia: Implications for social and economic policy,** by Graeme Hugo. April 1986, viii + 47 pp.

99 **Marriage and fertility in Tianjin, China: Fifty years of transition,** by Burton Pasternak. July 1986, viii + 76 pp.

100 **Migration in Thailand: A twenty-five-year review,** by Sidney Goldstein and Alice Goldstein. July 1986, viii + 54 pp.

101 **Recent fertility trends in the Pacific Islands,** by Michael J. Levin and Robert D. Retherford. August 1986, viii + 72 pp.

102 **Malnourished children: An economic approach to the causes and consequences in rural Thailand,** by Sirilaksana Chutikul. December 1986, viii + 64 pp.

103 **Consistent correction of census and vital registration data for Thailand, 1960–80,** by Norman Y. Luther, Neramit Dhanasakdi, and Fred Arnold. December 1986, viii + 40 pp.

104 **Basic data on fertility in the provinces of China, 1940–82,** by Ansley J. Coale and Chen Sheng Li. January 1987, xviii + 366 pp.

THE NATIONAL RESEARCH COUNCIL was established by the National Academy of Sciences in 1916 to associate the broad community of science and technology with the Academy's purposes of furthering knowledge and of advising the federal government. The Council operates in accordance with general policies determined by the Academy under the authority of its congressional charter of 1863, which establishes the Academy as a private, nonprofit, self-governing membership corporation. The Council has become the principal operating agency of both the National Academy of Sciences and the National Academy of Engineering in the conduct of their services to the government, the public, and the scientific and engineering communities. It is administered jointly by both Academies and the Institute of Medicine. The National Academy of Engineering and the Institute of Medicine were established in 1964 and 1970, respectively, under the charter of the National Academy of Sciences.

THE EAST–WEST CENTER is a public, nonprofit educational institution with an international board of governors. Some 2,000 research fellows, graduate students, and professionals in business and government each year work with the Center's international staff in cooperative study, training, and research. They examine major issues related to population, resources and development, the environment, culture, and communication in Asia, the Pacific, and the United States. The Center was established in 1960 by the United States Congress, which provides principal funding. Support also comes from more than 20 Asian and Pacific governments, as well as private agencies and corporations.

Situated on 21 acres adjacent to the University of Hawaii's Manoa Campus, the Center's facilities include a 300-room office building housing research and administrative offices for an international staff of 250, three residence halls for participants, and a conference center with meeting rooms equipped to provide simultaneous translation and a complete range of audiovisual services.

THE EAST–WEST POPULATION INSTITUTE, established as a unit of the East-West Center in 1969, carries out multidisciplinary research, training, and related activities in the field of population, placing emphasis on economic, social, psychological, and environmental aspects of population problems in Asia, the Pacific, and the United States.

ISBN 0-86638-092-2 $3.00